Report to Congress:

Expenses incurred by Medicare Beneficiaries for Prescription Drugs

May 1989

THE SECRETARY OF HEALTH AND HUMAN SERVICES
WASHINGTON, D.C. 20201

MAY 8 1989

The Honorable Jim Wright
Speaker of the House of Representatives
Washington, D.C. 20515

Dear Mr. Speaker:

Subsection 202(i) of the Medicare Catastrophic Coverage Act of 1988 (Public Law 100-360) requires the Secretary of Health and Human Services to submit a report to Congress on expenses incurred by Medicare beneficiaries for outpatient prescription drugs using data from the 1987 National Medical Expenditures Survey (NMES). I am pleased to submit the enclosed report in compliance with the provisions of the law.

Actuarial estimates of prescription drug expenditures by Medicare beneficiaries have been refined using the NMES data as well as other data which have been obtained recently. The refined estimates, presented in Chapter 3 of the report, have not changed significantly from those provided by the actuaries when the legislation was being considered by the Congress in 1987. Chapter 3 of the report also contains an extensive discussion of the methodology, assumptions and the various data bases used to develop the refined estimates.

It is my conclusion, based on these refined estimates and taking into account the Treasury Department's most recent projections of premium income, that the financing for the outpatient prescription drug benefit is not sufficient to cover the cost of benefits and related administrative costs payable from the Catastrophic Drug Insurance Trust Fund.

Recently, there have been calls from members of the Congress for reductions in the premium rates for the catastrophic coverage program based on February CBO estimates that show an increase of $4.4 billion in projected revenues since the time of enactment. These calls for reductions in premium rates were made based on CBO estimates of program outlays under the catastrophic coverage program. The fact that the latest available data confirm the

Administration's estimates of the drug program argues against taking any action to reduce either the flat or supplemental premium rates provided in the statute.

Sincerely,

Kevin E. Moley
Acting Secretary

Enclosure

THE SECRETARY OF HEALTH AND HUMAN SERVICES
WASHINGTON, D.C. 20201

MAY 8 1989

The Honorable Dan Quayle
President of the Senate
Washington, D.C.

Dear Mr. President:

Subsection 202(i) of the Medicare Catastrophic Coverage Act of 1988 (Public Law 100-360) requires the Secretary of Health and Human Services to submit a report to Congress on expenses incurred by Medicare beneficiaries for outpatient prescription drugs using data from the 1987 National Medical Expenditures Survey (NMES). I am pleased to submit the enclosed report in compliance with the provisions of the law.

Actuarial estimates of prescription drug expenditures by Medicare beneficiaries have been refined using the NMES data as well as other data which have been obtained recently. The refined estimates, presented in Chapter 3 of the report, have not changed significantly from those provided by the actuaries when the legislation was being considered by the Congress in 1987. Chapter 3 of the report also contains an extensive discussion of the methodology, assumptions and the various data bases used to develop the refined estimates.

It is my conclusion, based on these refined estimates and taking into account the Treasury Department's most recent projections of premium income, that the financing for the outpatient prescription drug benefit is not sufficient to cover the cost of benefits and related administrative costs payable from the Catastrophic Drug Insurance Trust Fund.

Recently, there have been calls from members of the Congress for reductions in the premium rates for the catastrophic coverage program based on February CBO estimates that show an increase of $4.4 billion in projected revenues since the time of enactment. These calls for reductions in premium rates were made based on CBO estimates of program outlays under the catastrophic coverage program. The fact that the latest available data confirm the

Administration's estimates of the drug program argues against taking any action to reduce either the flat or supplemental premium rates provided in the statute.

Sincerely,

Kevin E. Moley
Acting Secretary

Enclosure

RA
412.3
.R458
1989

Report to Congress:

Expenses Incurred by Medicare Beneficiaries for Prescription Drugs

---

Department of Health and Human Services

May 1989

TABLE OF CONTENTS

1. INTRODUCTION 1
   1.1. Purpose of this report. 1
   1.2. The Catastrophic Drug Insurance program. 3

2. FINDINGS FROM THE 1987 NATIONAL MEDICAL EXPENDITURE SURVEY (NMES) 7
   2.1. Third-party coverage of prescription drugs. . . . 7
   2.2. Changes over time in the use of prescription drugs by elderly beneficiaries. 8
   2.3. Differences in use and expenditures based on beneficiary characteristics. 11
   2.4. Use of prescribed medicines by therapeutic function. 14
   2.5. Use of prescribed drugs by condition. 14
   2.6. Use of generic prescribed medicine. 14
   2.7. Use of NMES to estimate aggregate and per capita expenditures. 15

3. DERIVATION OF COST ESTIMATES AND ANALYSIS OF PROGRAM VIABILITY 16
   3.1. Introduction. 16
   3.2. The prescription drug benefit model. 17
   3.3. Quantification of prescriptions per capita. . . . 18
   3.4. Quantification of cost per prescription. 27
   3.5. Distribution of expenditures around the mean. . . 30
   3.6. User rates and covered expenses. 32
   3.7. Induced demand. 33
   3.8. Benefit costs and implications for program viability. 35
   3.9. Summary. 40

BIBLIOGRAPHY 42

APPENDIX 1: DATA SOURCES USED IN THIS REPORT 48

APPENDIX 2: RELIABILITY OF ACTUARIAL ESTIMATES 58

APPENDIX 3: MATHEMATICAL DERIVATION OF COVERED EXPENSES . 63

APPENDIX 4: INDUCED DEMAND FOR PRESCRIPTION DRUGS 66

APPENDIX 5: NATIONAL MEDICAL CARE EXPENDITURES SURVEY REPORT 74

LIST OF TABLES

Table 1. Catastrophic Drug Insurance deductible and coinsurance amounts, calendar years 1990-1993 4

Table 2. Distribution of prescriptions filled in community pharmacies by aged customers, by age and type of payment: United States, 1988 7

Table 3. Summary of adjustments to Senior Scripts mean prescriptions per capita 19

Table 4. User rates, annual prescriptions per user, and cost per prescription for the Medicare population, 1977-1993 . . 28

Table 5. Projected monthly distribution of incurred benefits under Catastrophic Drug Insurance: 1991 36

Table 6. Comparison of Catastrophic Drug Insurance premiums and benefits during the first four years of operation . . . 38

Table 7. Comparison of PDS Senior Scripts customer counts and SMI enrollment by economic division of the United States . 49

Table 8. Number of pharmacies used by a sample of aged third-party card holders, 1988 51

Table 9. Average number of PACE claims per enrollee, by year and cohort: 1985-1987 56

Table 10. Comparison of HCFA estimates of mean drug expenditure by aged enrollees with private insurance plan experience, 1985 and 1986 61

Table 11. Values of e, r, and m, by values of k, from the distribution of prescription drug spending by Medicare enrollees, 1991-1993 64

LIST OF FIGURES

Figure A. Annual growth in prescriptions per capita for aged Medicare enrollees, 1978-1993 23

Figure B. Annual growth in the Consumer Price Index for all consumer items and for prescription drugs 30

1. INTRODUCTION

The Medicare Catastrophic Coverage Act of 1988 (Public Law 100-360) will result in major changes in the sources of payment of prescribed medicines for Medicare beneficiaries. Of concern at the time the Act was signed into law was an accurate assessment of the current use of prescriptions by the Medicare population, the extent to which Medicare payment for prescriptions might affect that use (a phenomenon known as "induced demand" or the "insurance effect"), and the effect of induced demand on the cost of the new prescription drug benefit.

1.1. Purpose of this report. This report is submitted pursuant to Section 202 of the Act, which states (in part):

"(i) REPORTS ON MEDICARE BENEFICIARY DRUG EXPENSES.--

(1) HHS.--The Secretary of Health and Human Services, by not later than April 1, 1989--

(A) using data from the 1987 National Medical Expenditures Survey (conducted by the National Center for Health Services Research and Health Care Technology Assessment) shall report to Congress on expenses incurred by Medicare

beneficiaries for outpatient prescription drugs ...."

In addition, Section 202 of the original House bill called for a number of studies, two of which were the following:

"(k) Additional studies. -- The Secretary of Health and Human Services shall conduct studies on the following issues:

(1) The extent of private or other third-party insurance coverage of covered outpatient drugs among Medicare beneficiaries. ...

(7) The potential for induced demand resulting from the coverage of covered outpatient drugs under the Medicare program."

The conference report that accompanied the legislation stated that the members expected the Secretary to address the two issues cited above when preparing the report required by the legislation.

This report contains the material requested by the Congress. Chapter 2 provides a summary of findings for the noninstitutional population from the National Medical

Expenditure Survey (NMES). Unfortunately, NMES data related to the institutionalized population and to prescription drug insurance are still being processed and were not available for this report. In response to the Congressional request for information on the issue of third-party financing, however, data from a third-party administrator of prescription drug programs are presented in the first section of chapter 2 of the report. The issue of induced demand is treated in chapter 3 of the report, in which the Secretary's estimates of benefit expenses under the Catastrophic Drug Insurance program are explained. As will be explained, these estimates are based on the latest available data, including not only the 1987 NMES, but data on prescription drug transactions collected directly from retail pharmacies as well. Outlay estimates are developed for the full prescription drug program, which covers both institutionalized and noninstitutionalized Medicare beneficiaries.

1.2. The Catastrophic Drug Insurance program. Section 202 of the Medicare Catastrophic Coverage Act of 1988 created as part of Medicare a Catastrophic Drug Insurance (CDI) program designed to protect the Nation's elderly and disabled against the high cost of prescription drugs. The program is scheduled to begin on January 1, 1990.

Coverage under the CDI program is automatically extended to any person enrolled in the Federal Supplementary Medical Insurance (SMI) program, and cannot be waived.

Generally, the program pays for outpatient drugs available only by prescription, and for insulin. However, in 1990, the first year in which benefits are provided, coverage is restricted to two types of drugs: those used in immunosuppressive therapy and those administered intravenously in a home setting (and approved for such therapy).

The CDI program is financed on a cash basis with a contingency margin. A flat monthly premium, the amount of which is established through calendar year 1993 by section 1839(g)(1)(A) of the Social Security Act, is paid by all SMI enrollees. In addition, anyone eligible to be enrolled in the Federal Hospital Insurance (HI) program for more than six full months is liable for a supplemental premium that is linked to their annual Federal income tax liability. The supplemental premium is established through 1993 by chapter 1, subchapter A, section 59B(d) of the Internal Revenue Code of 1986 (as amended).

The law specifies the types of benefits, amount of reimbursement, basis of payment, and administration. Generally, the plan pays a percentage of approved charges after

Table 1. Catastrophic Drug Insurance deductible and coinsurance amounts, calendar years 1990-1993

Year	Deductible	Coinsurance rate	Flat premium	Supplemental premium per $150 tax liability
1990	$550	50%	0	$10.36
1991	600	50%	$1.94	8.83
1992	652	40%	2.45	9.95
1993	850	20%	3.02	12.45

NOTE: The 1993 deductible is the Administration's current estimate of the level to be set so that 16.8 percent of enrollees reach that deductible. Residents of outlying territories pay different premiums.

the beneficiary has met a calendar-year deductible. The deductible and beneficiary coinsurance amounts are set in law through 1993 (Table 1), although the Secretary can delay the reduction of the coinsurance rate or increase the deductible in 1993, if such actions are warranted by the financial experience of the program. There are two exceptions to the above rules: Drugs used in immunosuppressive therapy during the first year after an approved organ transplantation are exempt from the requirements of the annual deductible. Drugs administered intravenously in a home setting (and approved for that use) that continue a treatment begun during a hospital stay are exempt from the requirements of the annual deductible, and the plan pays 80 percent of approved charges in all years of the program for drugs administered intravenously.

The financing of CDI is separated into two components (Table 1). Each enrollee pays a flat premium at a standard rate. The premium is set in law for 1990 through 1993. After 1993 and until 1998, the flat premium is adjusted to correct for shortfalls or surpluses in trust fund balances two years earlier, and to accommodate premiums that could not be collected under the supplemental rate discussed below. Beginning with 1998, the flat premium is also adjusted to reflect growth in program benefits two years earlier. Aggregate monthly premiums are designed to provide approximately 37 percent of trust fund premium income.

In addition to flat premiums, most people eligible for Hospital Insurance coverage must also pay a premium determined by their Federal income tax liability. This supplemental premium is expressed in terms of dollars per $150 of Federal tax liability, and is set in law for 1990 through 1993. After 1993 and until 1998, the supplemental premium rate is adjusted to correct for shortfalls or surpluses in trust fund balances two years earlier; beginning with 1998, the rate is also adjusted to reflect growth in program benefits two years earlier.

2. FINDINGS FROM THE 1987 NATIONAL MEDICAL EXPENDITURE SURVEY (NMES)

This chapter uses 1987 National Medical Expenditure Survey (NMES) data to estimate the patterns of prescription drug use and expenditures by the noninstitutionalized Medicare population. This population includes the aged population (those ages 65 or older) as well as people under the age of 65 who receive Medicare benefits because of disability or end-stage renal disease. At the time the report was prepared, data on institutionalized enrollees were still being processed. The discussion of third-party coverage of prescription drugs in section 2.1 is based on data from a third-party insurance administrator.

2.1. Third-party coverage of prescription drugs. Data from the NMES program designed to provide information on third-party coverage of prescription drugs were not available at the time this report was prepared. A substitute information source, the Senior Scripts data base, is used in this section. It is described in detail in Appendix 1.

Nearly 30 percent of all prescriptions filled in community pharmacies for aged customers was covered by Medicaid or some form of third-party insurance. Undoubtedly, some of the

Table 2. Distribution of prescriptions filled in community pharmacies by aged customers, by age and type of payment: United States, 1988

Customer age	Payment Type		
	Cash	Medicaid	Third-party
65-69 years	66.1%	7.8%	26.2%
70-74 years	71.2	8.3	20.4
75-79 years	72.6	9.9	17.4
80 years or older	72.3	12.2	15.5
Ages 65 or older	70.1	9.2	20.7

SOURCE: Health Care Financing Administration
Based on data from 1988 PDS Senior Scripts

remaining 70.1 percent of prescriptions were later reimbursed by insurance carriers who did not have an assignment agreement with the dispensing pharmacist.

Third-party coverage appears to be more prevalent among the "young" aged, while Medicaid benefits are more prevalent among the "old" aged. The share of claims identified at the time of dispensing as covered by insurance fell from 26.2 percent of prescriptions filled for aged under the age of 70 to 15.5 percent for those aged 80 or older. Conversely, Medicaid's share of claims rose from 7.8 percent of the young aged's prescriptions to 12.2 percent of the old aged's claims.

2.2. Changes over time in the use of prescription drugs by elderly beneficiaries. A recent report on the use of and

expenditures for prescribed medicines by the noninstitutionalized elderly Medicare population provides a basis for looking at changes between 1967 and 1980 (LaVange and Silverman, 1987). Data from NMES have been added to the table presented in this earlier study to reflect the long term trends (Table 3 in Appendix 5).

Looking only at information for elderly noninstitutionalized Medicare beneficiaries, data from NMES reveal there was an increase in the average number of prescriptions for this group between 1980 and 1987. Based on a comparison of data from the National Medical Care Utilization and Expenditure Survey (NMCUES) and NMES, the average number of prescriptions increased by 21.5 percent.

Not all elderly noninstitutionalized Medicare beneficiaries use prescription drugs in the course of the year. In 1987, 82.1 percent of the elderly beneficiaries used at least one prescribed medicine. This percentage is 2 percentage points higher than the 1980 estimate, although the difference is not statistically significant.

On the other hand, a comparison of data from these two surveys shows that the average cost per prescription more than doubled between 1980 and 1987. The average cost per prescription, in fact, increased at an average annual rate of

11.2 percent. For the same period, the CPI showed the cost per prescription increased an average of 9.9 percent annually, or a total of 94.2 percent.[1] The 1.3 percentage point difference in the annual rate of increase between NMES and the CPI inflation estimate for prescription medicines may reflect, in part, an increase in the average prescription size and the introduction of new and higher priced drugs into the market.[2]

Largely because of this price inflation, the average annual expenditures for prescribed drugs by the elderly Medicare population increased at an average annual rate of 14.2 percent between 1980 and 1987.

The 3 percentage point difference between the increase in the average annual per capita expenditure (14.2 percent) and the average annual increase in the cost of a prescription (11.2 percent) is attributable in part to the increase in the average number of prescriptions obtained by Medicare beneficiaries between 1980 and 1987.

---

[1] The level of the Consumer Price Index (CPI) for prescription medicines for 1980 and 1987 was 72.5 and 140.8, respectively (the 36-month period between 1982 and 1984 being used as a baseline).

[2] The prices of new drugs are typically not reflected in the CPI immediately after they reach the marketplace. According to the BLS, new prescription items that substitute for old ones in the CPI replace the old ones only when they reach a critical volume in the marketplace. Otherwise new prescribed medicines are included in the CPI only when the weights for the index are revised every 5-10 years.

2.3. Differences in use and expenditures based on beneficiary characteristics. Use and expenditures for prescription drugs vary with the characteristics of noninstitutionalized Medicare beneficiaries. These variations are useful in understanding who may be helped by the prescription drug benefit and at what cost. Detailed information on the use of prescribed medicines by selected characteristic of the beneficiary population is presented in Tables 5, 6, and 7 of Appendix 5.

The probability of obtaining at least one prescription during the year, the average number of prescriptions, and the average annual expenditures for prescription drugs all increased with age for the population between 65 and 84. The situation was somewhat different for those over 85 years, in part because of the exclusion of institutionalized Medicare individuals, who are heavily represented in this oldest age group[3].

This pattern of change in use with age was similar for both males and females. However, females had a significantly higher utilization of prescribed medicines than males. The NMES data

[3] The 85 and older age group in NMES also had the largest proportion of part-year Medicare eligibles due to death and institutionalization.

show that females obtained, on average, approximately 18 percent more prescriptions than males and incurred an average of 10 percent more expenses than males during 1987.

Medicare beneficiaries who had difficulty with one or more Activities of Daily Living (ADLs) or who were in poor or fair health as measured by self-reported health status had significantly greater prescription drug use. Persons reporting difficulty with only one ADL obtained, on average, 70 percent more prescriptions than those with no ADL limitations. Those having difficulty with two or more ADLs had, on average, 87 percent more prescriptions filled than those with no problems. Persons who perceived themselves as being in poor health had, on average, about six times both the number of prescriptions and expenditures as those in excellent health.

The use of prescribed medicines by noninstitutionalized Medicare beneficiaries declined as family income increased. The percentage of beneficiaries who had at least one prescription during the year was greatest for persons in families with incomes near or below the poverty line. Those in poverty had 5.8 more prescriptions filled during the year than beneficiaries in the highest income group. The poor had an average annual expenditure for prescription drugs that was 22.0 percent higher than for the wealthy.

The NMES data show that Medicare beneficiaries reporting Medicaid coverage obtained, on average, 55 percent more prescriptions than beneficiaries with only Medicare coverage. They had average annual prescription expenditures which were 60 percent greater than the expenditures reported by those without supplemental coverage. Information is not yet available from NMES on beneficiaries with and without coverage of prescribed medicines in their private health insurance plans or the variations in coverage between Medicaid plans. Therefore, it was not possible to use NMES data to examine directly how supplementary coverage of prescriptions might affect use and expenditures[4].

Medicare beneficiaries living in the South averaged 16.4 percent more prescriptions during the year than persons living in the West. More than 29 percent of the noninstitutionalized Medicare beneficiaries in the South obtained in excess of 21 prescriptions during 1987. The comparable percentage for those in the West was 23.3 percent.

---

[4] The NMES Health Insurance Plan Survey (HIPS) will contain information on coverage of prescribed medicines under private health insurance plans and will enable such an analysis when these data become available in the future. See Chapter 3 of Appendix A of this report for further discussion and analysis of this topic with other data sources. Note that the comparisons of prescription expenditures involving Medicare enrollees with Medicaid coverage are affected by the imputation procedure in NMES for charges for prescribed medicines purchased by these individuals - see Technical Appendix D to Appendix A of this report.

Other findings with respect to how prescription use and expenditures vary by the characteristics of Medicare beneficiaries can be found in Tables 5, 6, and 7 of Appendix 5.

2.4. Use of prescribed medicines by therapeutic function. The prescriptions classified as cardiovascular medicines (29.1 percent) and central nervous system medicines (19.3 percent) together accounted for almost one-half of the prescriptions obtained by the noninstitutionalized Medicare population in 1987. The other 50 percent was distributed among the remaining eight categories of therapeutic functions identified in Table 8 of Appendix 5, which illustrates how the use of prescribed drugs classified by therapeutic function differs by the characteristics of the Medicare population.

2.5. Use of prescribed drugs by condition. Diseases of the circulatory system were most often cited by household respondents as the reason for obtaining a prescription (39 percent), followed by endocrine disorders (10 percent). Generally, the distribution of prescriptions by conditions was not affected by family income, poverty status, health insurance status, employment, and education (Table 9 of Appendix 5).

2.6. Use of generic prescribed medicine. Almost one-fourth of the prescriptions purchased by the noninstitutionalized

Medicare population were generic prescribed medicines. The percentage distribution between generic and brand name prescriptions appears in Table 10 of Appendix 5 for subgroups of the Medicare beneficiaries defined by various population characteristics. The use of generic prescriptions varied by family income, poverty status, health insurance status, and education of Medicare beneficiaries. Beneficiaries in families below the poverty line used generic medicines more often (27.0 percent of their total) than did those in families with incomes more than 4 times the poverty levels (23.3 percent of total prescriptions). Persons with Medicare coverage only, or with both Medicaid and Medicare coverage, obtained a higher percentage of generic prescriptions (28.8 and 29.8 percent), respectively) than medicare beneficiaries with private health insurance (23.3 percent.)

2.7. Use of NMES to estimate aggregate and per capita expenditures. Data from NMES were not used to estimate total prescription drug spending by Medicare enrollees. Like other household data, NMES is subject to response error and bias that make it impossible to derive aggregate figures directly. For a full discussion of this problem, see Appendix 1 and Technical Appendix E to Appendix 5 of this report.

3. DERIVATION OF COST ESTIMATES AND ANALYSIS OF PROGRAM VIABILITY

3.1. Introduction. In establishing the Medicare Catastrophic Drug Insurance (CDI) program, the 100th Congress hoped to provide a cost-effective means of insuring against catastrophic drug expenses incurred by the 30-plus million enrollees in Supplementary Medical Insurance (SMI). Unfortunately, at the time the legislation was considered, there was only fragmentary evidence available to legislators on the cost of such an insurance program. Direct survey of pharmacy activity by the aged population on a national basis was nonexistent, and the latest survey of the Medicare population itself had been conducted in 1980. Analysts in the Administration and in the Congressional Budget Office, working independently and making different assumptions concerning the validity and utility of the various pieces of information available, developed widely divergent estimates of the cost of the CDI program.

Using data that have become available during the last six months, actuaries in the Health Care Financing Administration (HCFA) have refined their estimates of the benefit costs of the CDI program. The new estimates continue to show that the program is seriously underfunded. Although the precise status

of the trust fund is still being determined, the benefit estimates clearly indicate that the CDI trust fund is not solvent.

This chapter explains how the HCFA actuaries reached their estimates of the benefit cost of the CDI program. The basic model used is described, and the manner in which each component of the model was quantified is detailed. Finally, benefit costs are compared with the most recent Treasury Department estimates of program income, showing that the program will be unable to pay benefits by 1992. In separate appendices, the various data sources used to quantify the model are described, and the benefit estimates are compared to other measures of prescription drug spending.

The model described below applies only to the full program, which starts in 1991. In 1990, CDI coverage is limited to drugs used in immunosuppressive therapy and to those administered intravenously in a home setting. HCFA actuaries estimate that about 36,000 people will receive benefits totalling $130 million for immunosuppressive drugs, and that another 64,000 people will receive about $60 million in benefits for intravenous drugs.

3.2. The prescription drug benefit model. The model used to prepare HCFA's cost estimates has four components. The first

two components--prescriptions consumed per capita and charge per prescription--are combined to yield a mean (average) annual expenditure per user for prescription drugs in the absence of a CDI benefit. The third component of the model is a distribution of expenditures around that mean which, when applied, helps to determine how much expenditure is eligible for reimbursement. Finally, a measure of the insurance effect--the extent to which introduction of CDI benefits changes consumption of prescription drugs--is applied to covered expenses, to arrive at a final benefit figure.

3.3. Quantification of prescriptions per capita. In order to project use of prescription drugs in the future, it is necessary to establish both a benchmark level and a trend. The steps taken to do so are explained below.

Benchmark level. HCFA's estimate of prescriptions per capita is based on data from Pharmaceutical Data Services, Incorporated (PDS). As explained in Appendix 1 to this report, the PDS "Senior Scripts" data come from a national subset of pharmacies, and provide customer-level information on (among other things) the number of prescriptions filled for people aged 65 years or older. The data set covers calendar year 1988 retail pharmacy purchases by the noninstitutional elderly, and probably those by the bulk of elderly nursing home patients,

since relatively few nursing homes maintain an in-house pharmacy.

Table 3. Summary of adjustments to Senior Scripts mean prescriptions per capita

Pharmaceutical Data Services "Senior Scripts" retail pharmacy aged customer mean prescriptions	14.2
Re-weighted to reflect HCFA population weights	12.8
Multiplied by the ratio of customers to users in the population	x 1.52
Equals the retail pharmacy user mean	19.5
Multiplied by an increase factor for hospital outpatient pharmacy (2.4%) and mail-service pharmacy (4.0%) use	x 1.064
Equals final outpatient prescriptions per aged user	20.7

SOURCE: Health Care Financing Administration
Based on data from Pharmaceutical Data Services, Inc.

However, the Senior Scripts data must be adjusted in order to meet the requirements of the analysis: a national mean number of prescriptions per user. The steps taken to do so are summarized in Table 3.

First, the data base is heavily skewed toward the midwest and southeast of the Nation; population-based surveys tell us that consumption in these regions is higher than the national average. To remove this bias, the number of Medicare enrollees

in each of eight economic divisions of the nation was used to re-weight the PDS data to reflect the Nation as a whole.

Second, the PDS data reflect customers, rather than users. A customer is defined to be one person in one pharmacy. Thus, a single individual who purchase three prescriptions from one pharmacy and three prescriptions from another would appear in the data base as two customers with three prescriptions each, rather than one user with six prescriptions. Fortunately, it is fairly simple to modify the aggregate mean to correct for this feature of the data. From a sample of 1,024 aged drug users, drawn from another PDS data set in which people with third-party reimbursed drug coverage are identified across pharmacies as well as within pharmacies, the ratio of customers to users was determined. Multiplication of the mean number of prescriptions per customer by this ratio produces an estimate of a user mean prescription, which is what is needed.

Finally, the PDS data set excludes hospital outpatient pharmacies and mail-service pharmacies, both of which dispense drugs eligible for reimbursement under CDI. Industry sources provided a correction factor for each of these omissions, based on their share of the total outpatient prescription drug market; hospital outpatient dispensing is estimated to add 2.4 percent to the user mean prescription, and mail-service pharmacies to add 4.0 percent. The combination of all these

factors produces a mean annual figure of 20.7 prescriptions per user that applies to the aged population (Table 4).

In order to assess better the use of prescription drugs by the aged population, the overall mean for that population was subdivided. A study of the Pennsylvania Pharmaceutical Assistance Contract for the Elderly (PACE), a State-run drug benefit program, provided information on the relative use of drugs by aged nursing home residents and noninstitutional aged from 1985 through 1987. Results from the study show that nursing home residents used an average of 2.51 prescriptions per month, 45 percent more than the 1.73 prescriptions per month used by noninstitutional enrollees. That institutional/noninstitutional ratio was used in 1988 to derive prescription rates for the two groups. To further subdivide the noninstitutional population into constituent age cohorts, data from the 1987 National Medical Expenditures Survey (NMES) were used. As mentioned in Appendix 5 of this report, use of prescription drugs rises with age until the very oldest age cohort (by which time, we suspect, many of those with high prescription drug use have been institutionalized and therefore are represented in the rate for that group).

A separate mean prescription count was maintained for the disabled population, mainly because it was difficult to identify those people through pharmacy records. Data from the

1987 National Medical Expenditure Survey indicate that disabled Medicare enrollees using prescription drugs had 47 percent more prescriptions than did aged users, a factor that was assumed to hold in 1988 as well.

Data from the NMES survey, although important to the quantification of the prescription drug model, were not used to determine the aggregate level of consumption. The strength of a population survey lies in its ability to relate spending with socio-demographic and economic factors, and it is in these areas that the survey results were used. However, population surveys also reflect errors of recall and omission on the part of respondents, a fact confirmed by surveys previous to NMES and explained in greater detail in Exhibits E-1 and E-2 of the technical appendices to Appendix 5 and in Appendix 1 of this report. Consequently, reliance upon NMES alone to estimate the level of expenditure for prescription drugs would lead to an underestimate of actual experience.

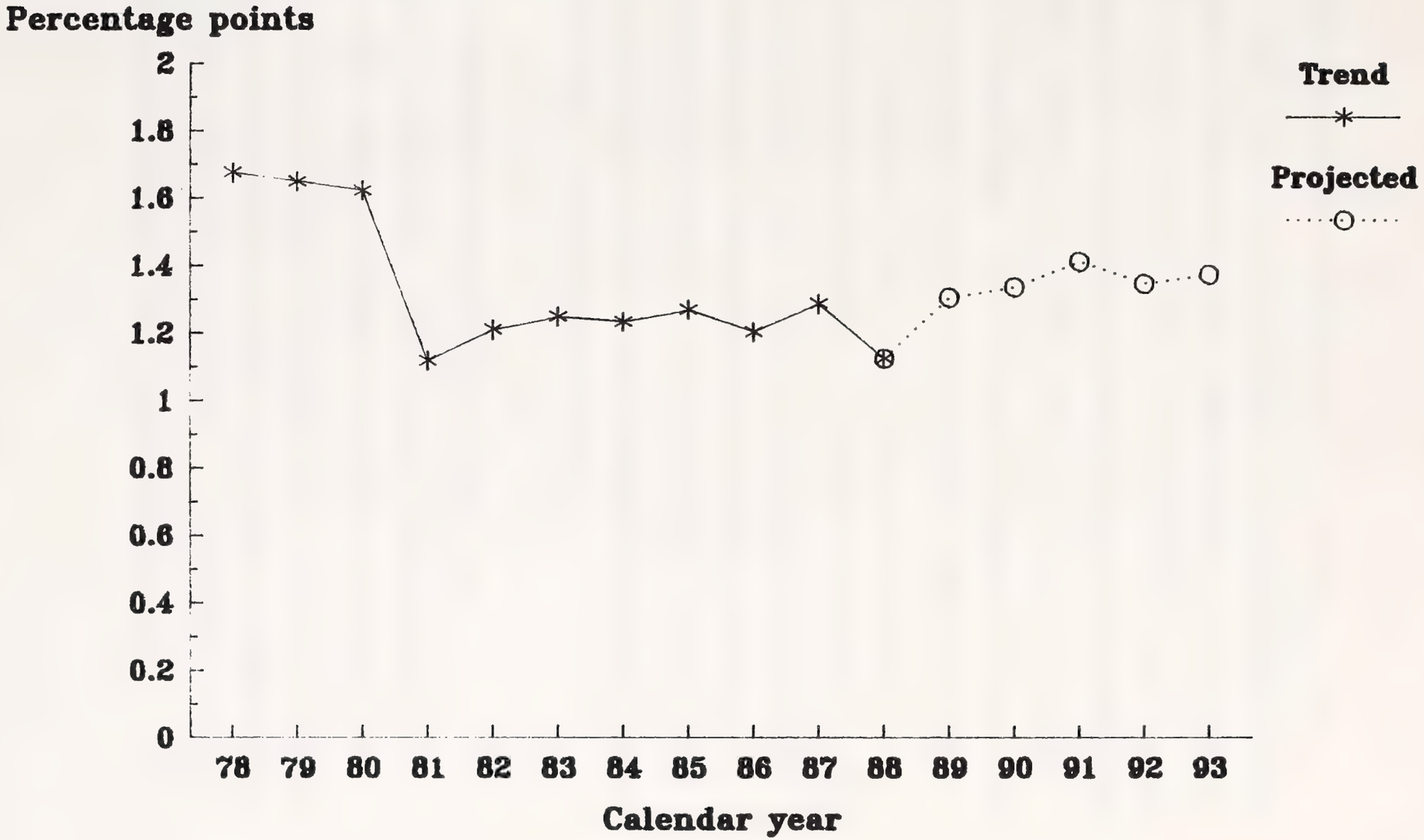
Trend in prescriptions per user. Establishing a trend in mean prescriptions per capita was more difficult than establishing a benchmark. Ultimately, three time periods were analyzed and concatenated; in order to isolate the demographic effects of aging upon trends, trends were established for four subgroups of noninstitutional aged (65-69 years, 70-74 years, 75-79 years, and 80 years or older), for the institutionalized

aged, and for the disabled. Data from Household surveys were used to derive the noninstitutional subgroups' use relative to one another, as is explained below. The aggregate trend in prescriptions per capita is shown in Figure A.

The early end of the trend was established by data from the Current Medicare Survey (CMS), which provided estimates of use of and spending for prescription drugs by aged Medicare enrollees. The CMS was a monthly survey of a sample of enrollees, most of whom were noninstitutional.

For 1977 and 1980, national population surveys helped to determine a trend. The 1977 National Medical Care Expenditure Survey (NMCES) and the 1980 National Medical Care Utilization and Expenditure Survey (NMCUES) each involved a sample of the entire U.S. population, and determined (among other things) the socio-demographic associations with prescription drug use. Under-reporting in household surveys mentioned earlier does not cause a problem in determining a trend, as long as the extent of under-reporting is the same in both surveys. However, comparison of the survey data with estimates of aggregate prescription drug retail sales prepared by the Actuarial Research Corporation using pharmaceutical industry data, suggested that the NMCES survey suffered more under-reporting than did NMCUES, biasing upward the trend in prescriptions per capita by about .3 percent per year. HCFA actuaries adjusted

FIGURE A
Annual growth in prescriptions per capita for aged Medicare enrollees, 1978–1993



SOURCE: Health Care Financing Administration

the trend from 1977 through 1980 downward to correct for that bias.

For the trend from 1980 through 1988, a variety of data sources were used, all of which tended to show similar results. Data from the 1987 National Medical Expenditure Survey (NMES), when compared to similar data from the 1980 NMCUES, established a slight upward trend in prescriptions per capita (although the extent of under-reporting in NMES relative to that in NMCUES has yet to be determined). This trend is confirmed by 1980 and 1985 National Ambulatory Medical Care Survey (NAMCS) data on drug mentions (physician reports of drugs prescribed or discussed during patient contacts). The trend observed in the NAMCS is somewhat weaker than that established by NMCUES and NMES data. Estimates of drug mentions from IMS America's National Diagnostic and Therapeutic Index (NDTI) provide additional confirmation of the trend, although the NDTI trend is much stronger than either of the other two.

The trend mentioned above pertains to the aged noninstitutional population; those for the institutional and the disabled populations are more difficult to ascertain. In the case of the institutional, the problem is simply that very few surveys of nursing home residents have been conducted, and none provide good prescription drug data. The trend for the disabled population poses the same problem faced when

establishing a benchmark level for them: disabled Medicare enrollees are not readily identified from aggregate data. For each of these groups, use relative to the noninstitutional population was measured at two points in time. A study of institutional respondents to the 1973 CMS survey, and a recent study conducted by the University of Pennsylvania of data from the PACE program (that State's pharmaceutical assistance program for its elderly), allowed HCFA actuaries to establish a trend in institutional use relative to that of the noninstitutional population. Tabulations from the 1977 NMCES and 1987 NMES surveys performed a similar role in regard to the disabled population.

When applied to the 1977 average annual prescriptions per capita from the Current Medicare Survey, the composite trend for the aged (reflecting both institutional and noninstitutional users) produced an estimated average of 20.8 prescriptions for the aged in 1988. This level was almost identical to the benchmark of 20.7 prescriptions developed using the PDS data sets. The fact that these two numbers, derived using separate data sources and techniques, were almost identical strongly supports the accuracy of the estimate of average annual prescriptions per capita for the aged.

Extending a trend into the future is a risky business, especially for a service which is changing as rapidly as has

prescription drugs. Recent innovations in drug therapy have changed the nature of drug use considerably. Enormous investments in research on drugs affecting conditions and diseases of aging portend a continuation of that change. For the near term, however, the past is still prologue: Between now and 1993 the recent trend is likely to prevail.

3.4. Quantification of cost per prescription. As with prescriptions per capita, quantifying the cost per prescription involves establishing a benchmark level and a trend. Again as with prescriptions per capita, separate prices were established for four cohorts of the noninstitutional aged population, for the institutional aged population, and for the disabled population. The reason for maintaining these distinctions is that the maintenance drugs used by chronically ill people tend to be less expensive than other types of drugs, a factor that plays an increasing role in the cost of drugs used by older Americans and those in nursing homes. Similarly, the disabled population uses a different mix of drugs, necessitating a different price measure. To differentiate the prices paid by these groups, data from the 1977 NMCES, 1980 NMCUES and 1987 NMES surveys and the PACE study were used.

Benchmark levels. The three groups' (noninstitutional, institutional, and disabled) benchmarks were established in different ways. The 1977 CMS estimate of cost per prescription

was selected as benchmark for the aged population. Relative prices for the institutional and noninstitutional populations from the 1973 CMS study were used to create prices for those two groups that were consistent with the 1977 total. NMCUES and NMES data were used to further disaggregate the noninstitutional population. Comparisons of aged and disabled cost per prescription from the 1977 NMCES and 1988 NMES established both the benchmark and the trend for the latter group (Table 4).

The PDS data set used to establish prescriptions per capita was not used for cost per prescription. Principally, this was because there were other data available that did not need major work done to reflect national experience. The PDS data were concentrated in the Midwest and Southeast, where prices tend to be different from national averages. The data could be adjusted to mitigate that concentration, but the presence of other recent data made that work unnecessary.

Trend in cost per prescription. IMS America publishes annual estimates of cost per prescription taken from their National Prescription Audit (NPA), which reflects not only pure inflation but also changes in the mix of drugs used and in prescription size (the number of pills per prescription). The 1987 NMES estimates of cost per prescription fell squarely on the trend line established by the IMS data and the 1977 CMS

Table 4. User rates, annual prescriptions per user, and cost per prescription for the Medicare population, 1977-1993

	1977	1988	1993
Users as a percent of enrollees			
Total	80.2%	82.9%	84.5%
Aged	80.5	83.0	84.8
Noninstitutional	80.2	82.7	84.4
65-69 years	76.7	77.0	77.0
70-74 years	78.5	83.0	85.8
75-79 years	83.5	85.7	87.0
80 years or older	86.0	88.2	89.5
Institutional	85.8	89.0	90.9
Disabled	77.6	82.1	82.1
Annual prescriptions per user			
Total	18.5	21.5	23.3
Aged	17.9	20.7	22.5
Noninstitutional	18.9	19.9	21.6
65-69 years	16.3	18.0	19.9
70-74 years	19.3	20.9	22.5
75-79 years	22.6	20.4	22.0
80 years or older	19.3	21.0	22.6
Institutional	34.5	33.8	35.7
Disabled	24.4	29.2	31.8
Cost per prescription			
Total	$6.53	$18.21	$24.26
Aged	6.60	17.99	23.97
Noninstitutional	6.00	18.22	24.27
65-69 years	6.35	18.86	25.14
70-74 years	6.16	18.35	24.46
75-79 years	5.73	18.12	24.15
80 years or older	5.62	17.40	23.21
Institutional	6.01	16.14	21.53
Disabled	6.00	19.77	26.34

NOTES: Users are people with at least one prescription

SOURCE: Health Care Financing Administration

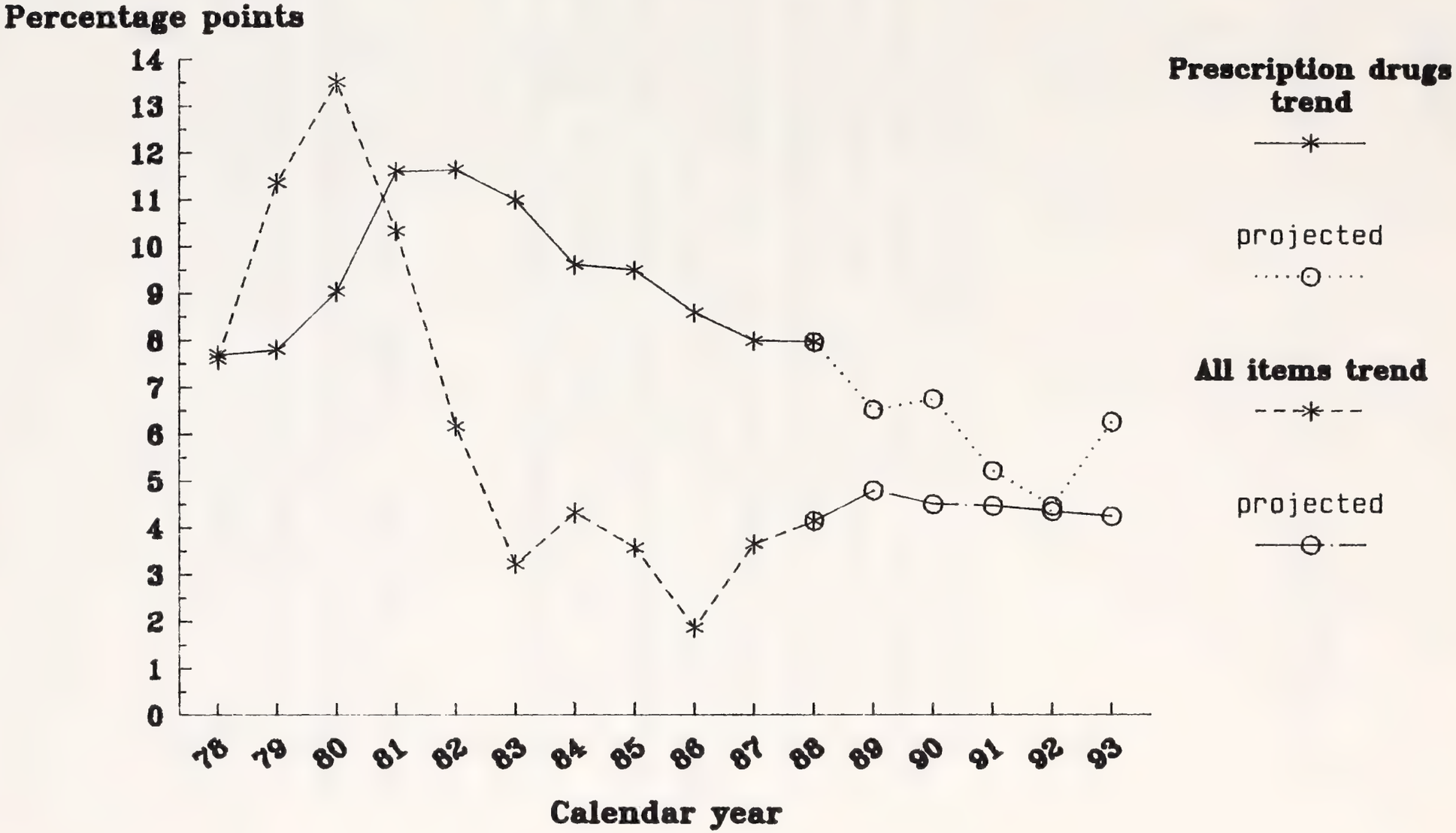
figures, providing independent confirmation of the model used.

To project the trend in cost per prescription into the future, HCFA actuaries separated it into two parts: that reflected by the consumer price index for prescription drugs (CPI-Rx), and a residual trend that reflects prescription size, drug mix, and other "intensity" factors. The CPI-Rx was projected into the future using the drug component of HCFA's hospital input price index (Figure B); although that component is a measure of producer prices rather than consumer prices, the relationship between the two has been virtually constant over time. The residual trend has been very small in the recent past, averaging about .2 percent per year for the aged noninstitutional population since 1977. For the projection period, HCFA actuaries used a figure below the 1977-87 average.

3.5. Distribution of expenditures around the mean. Having determined an average level of spending for the Medicare population, the next order of business is to find the distribution of prescription drug users around that mean.

A useful candidate for the theoretical distribution is the gamma. In this distribution, the probability of a value x occurring is:

FIGURE B
Annual growth in the Consumer Price Index for all consumer items and for prescription drugs



SOURCE: Health Care Financing Administration

$$f(x) = \frac{a^b}{\Gamma(b)} x^{b-1} e^{-ax}$$

where the arithmetic mean and variance of the distribution are:

$$E(x) = \frac{b}{a} \text{ and}$$

$$V(x) = \frac{E(x)}{a} = \frac{b}{a^2}$$

A nonlinear least-squares fit of interval frequencies for each of the years 1967 through 1977 (from the CMS survey) and for 1987 (from the NMES survey) yielded estimates of the parameters of the gamma distribution. The value of b appears to be roughly constant over time, and the average value of b from the 1967-1977 regressions has been carried forward through time. Values for a, the scale factor, have been determined by the value of b and the arithmetic mean; in this way, the distribution for any given year will be centered on the average expenditure per user.

3.6. User rates and covered expenses. Knowledge of the mean and distribution of spending for prescription drugs allows one to calculate covered expenses--those over and above any given annual amount. To find the latter, an estimate of the user rate--the proportion of enrollees who use drugs--is multiplied

by the number of enrollees. As with prescriptions per capita, it is important to determine this rate for subgroups of the population, as prescription drug use varies with age and institutional status. Data from the various CMS surveys and the 1980 NMCUES and 1987 NMES surveys were used to estimate user rates for the noninstitutional aged population and four of its age subgroups. The 1973 CMS survey and the 1988 study of PACE data provided information on use of drugs by the institutional aged. The 1987 NMES and 1977 NMCES survey produced data used to establish user rates for the disabled population. In 1987, for example, 82 percent of the noninstitutional aged used at least one prescription, a proportion that increased with age until the oldest cohort (at which point, we suspect, most of the ill members of the cohort have been admitted to nursing homes). About 89 percent of the institutionalized aged used drugs in 1987, and about 82 percent of the disabled Medicare population (Table 4). Appendix 3 to this report contains the mathematical derivation of covered expenses for 1991 through 1993.

3.7. Induced demand. It is commonly acknowledged in the insurance industry that the very act of coverage tends to increase demand for the covered good or service. This insurance effect, or "induced demand," can occur through either of two channels. The presence of an insurance benefit reduces the cost to the consumer at the time of purchase; standard

economic theory holds that, all other things equal, people tend to consume more of something when its price is lower than they do when it is higher. Further, providers of care are more likely to prescribe drugs, or to prescribe more expensive drugs, when their patient is insured against drug expense. Consequently, the induced demand can arise from either or both sides of the provider-patient relationship. In addition, induced demand can take the form of more prescriptions per capita, higher cost per prescription, or both.

While the existence of induced demand is widely accepted, there is considerable disagreement over the extent of that effect. Estimates in the literature of its size range from almost nothing to an amount that doubles original demand. Many of these estimates vary because of differences in the deductible and coinsurance rates considered. For example, it is possible that induced demand in the form of more prescriptions per capita is likely to be smaller at the upper end of the expenditure distribution than in the mid-range or at the lower end. On the other hand, induced demand in the form of higher cost per prescription is not necessarily limited to any particular part of the expenditure distribution. For example, a month's supply of Feldene, an anti-arthritic drug with more efficacy and fewer side effects than aspirin, currently costs around $50 in the Baltimore area; the presence of insurance coverage could induce a physician to switch from a

cheaper anti-inflammatory to Feldene regardless of the number of other drugs the patient is taking.

In addition to the induced demand of the CDI program itself, it is important to consider demand induced by changes in Medigap policies as a result of introducing CDI. Private insurance could significantly increase drug spending by covering coinsurance and deductibles. To the extent that this occurs, the total demand induced would be greater than that induced by the CDI program alone.

HCFA actuaries assume an insurance effect in 1991 that would increase aggregate consumption of drugs by the Medicare population by about 10 percent. In 1992, as the coinsurance rate faced by beneficiaries falls, aggregate consumption is projected to be about 12 percent higher than it would have been in the absence of the program. In 1993, an increase in the deductible and a decrease in the coinsurance rate produce effects that partially offset each other, resulting in consumption that is projected to be about 11 percent greater than would have been the case in the absence of the program.

3.8. Benefit costs and implications for program viability. The material developed above combines to produce an estimate of incurred benefits under the CDI program. Incurred benefits are defined on a calendar year basis, and refer to the cost of

those prescriptions filled during the calendar year and eligible for reimbursement.

The most recent benefits estimates are about 10 percent lower than those produced during debate over the legislation that led to creation of the CDI program, and about 5 percent lower than those used in last year's midsession budget review. This reduction is due to the incorporation of new and updated information, including the preliminary NMES results, in the estimation of mean annual per capita expenditures, and to lower inflation projections.

Timing of benefit payments. In a program with a deductible, benefits are not incurred evenly throughout the calendar year. Evidence from the PDS Senior Scripts data set shows that prescriptions themselves tend to be distributed evenly throughout the calendar year; however, it takes most people several months (if ever) to reach the

Table 5. Projected monthly distribution of incurred benefits under Catastrophic Drug Insurance: 1991

Month	Percent
January	0.0%
February	0.5
March	2.0
April	3.5
May	5.5
June	8.0
July	10.0
August	11.5
September	13.0
October	14.0
November	15.5
December	16.5

SOURCE: Health Care Financing Administration

deductible level beyond which the CDI program pays benefits. Almost half of all calendar year 1991 claims are projected to be incurred during October, November, and December of that year (Table 5).

There is a further complication added by a payment lag. HCFA actuaries assume that it will take about one month from the time a prescription is filled until the time the claim is paid. Under this assumption, fully 16 percent of calendar year claims--those incurred in December--would not be paid until the following calendar year. Claim payments made during a given period, regardless of the date on which they were incurred, are referred to as "cash benefits," distinguishing them from the incurred benefits described above.

Comparison of benefit levels with revenues. In order to assess the viability of the CDI program as it stands, it is necessary to compare program revenues and expenses. There are two tests of the program: first, there should be enough cash on hand to pay claims; second, the program should not have more liabilities (claim payments due) than it has assets (income and savings).

The CDI program is expected to receive revenue from three sources. Each enrollee in SMI will pay a <u>flat monthly premium</u>; the aggregate flat premiums are intended by Congress to cover

nearly two fifths of the cost of the program. In addition, every person eligible for Medicare's hospital insurance program must pay a supplemental premium tied to their Federal income tax liability. This source of revenue was expected to yield over three fifths of program costs. Finally, trust fund interest income was expected to contribute a relatively minor amount of revenue.

As with benefits, cash flows produce a difference between premium liabilities and receipts. Earned premiums refer to those premiums for which the beneficiary is liable during the calendar year. However, a substantial portion of supplemental premiums is expected to be paid in April of the following year, with Federal income taxes; premiums received during a period include some premiums earned earlier and exclude some premiums earned but not yet paid.

A comparison of revenues and benefit expenses does not tell the whole story about the viability of the CDI program, but it does demonstrate the inadequacy of the financing. A complete accounting of the trust fund will be prepared for submission to Congress by its Board of Trustees. In that report, interest income and administrative expenses will be included; the latter item is estimated to be in excess of $500 million per year beginning in calendar year 1991. However, a comparison of the Administration's most recent estimates of premiums and benefits

Table 6. Comparison of Catastrophic Drug Insurance premiums and benefits during the first four years of operation

(millions of dollars)

	1990	1991	1992	1993	Total
CALENDAR YEAR INCURRED					
Premiums earned	1,662	2,281	2,811	3,617	10,371
Flat	5	810	1,072	1,339	3,226
Supplemental	1,657	1,471	1,739	2,278	7,145
Benefits incurred	190	2,915	3,862	4,350	11,317
Surplus (deficit)	1,472	(634)	(1,051)	(733)	(946)
CALENDAR YEAR CASH					
Premiums received	926	2,581	2,786	3,474	9,767
Flat	5	810	1,072	1,339	3,226
Supplemental	921	1,771	1,714	2,135	6,541
Benefits paid	159	2,465	3,705	4,207	10,536
Surplus (deficit)	767	116	(919)	(733)	(769)
FISCAL YEAR CASH					
Premiums received	849	2,391	2,707	3,384	9,331
Flat	3	611	1,005	1,273	2,892
Supplemental	846	1,780	1,702	2,111	6,439
Benefits paid	78	1,307	3,302	3,869	8,556
Surplus (deficit)	771	1,084	(595)	(485)	775

NOTES: Benefits are assumed to be paid even when there is insufficient cash in the trust fund to do so. The 1993 estimates do not reflect any exercise of the Secretary's statutory authority to reduce CDI outlays in that year.

(Table 6) indicates that the CDI program is in a seriously compromised financial position.

On an incurred basis, financing is inadequate almost immediately. Incurred benefits alone exceed earned premiums in

1991, and by 1992 any surplus from previous years is projected to have evaporated.

An examination of CDI's calendar year cash position also demonstrates the inadequacies of the financing. By the end of 1992, there is insufficient cash on hand to pay claims, so that some benefits would have to be deferred until additional premiums come in.

Use of a fiscal year perspective tends to obscure the problems faced by the trust fund. Because nearly half of a calendar year's benefits are not incurred until after the fiscal year closes, fiscal year benefit payments in the early years of the program appear small. Premiums received, on the other hand, are affected much less than are benefits, so that the financial difficulties of the program do not appear until fiscal year 1993. The misleading nature of fiscal year figures is amply demonstrated by a comparison of calendar year and fiscal year data in Table 6.

3.9. Summary. Using the most recent data available, HCFA actuaries have constructed an estimate of the use of prescription drugs by Medicare SMI enrollees, and have projected the benefits under the existing Catastrophic Drug Insurance program.

Although the most recent estimates of benefit expenditures have been revised downward since the debate on the legislation creating CDI, and the estimates of supplemental revenue have been revised upward, it still appears quite likely that premium revenues established by the law that created CDI will not be sufficient to meet the costs of paying benefits and administering the program. Over the first four years of the program, incurred benefits are projected to exceed earned premiums by almost $1 billion, a shortfall that rises to about $3 billion when administrative costs of the program are included.

BIBLIOGRAPHY

Deacon, R.: Current Medicare Survey report: Supplementary Medical Insurance: Characteristics of aged institutionalized enrollees, 1973. HEW Pub. No. (SSA) 78-11702. Social Security Administration, Oct. 1977.

Ginsburg, P. and Curtis, M.: Choice of Demand Parameters for Congressional Budget Office National Health Insurance Cost Estimates. Washington, D.C. Congressional Budget Office. Unpublished memorandum, Nov. 1978.

Goddeeris, J. and Weisbrod, B., "What We Don't Know about Why Health Expenditures Have Soared: Interaction of Insurance and Technology," Mount Sinai Journal of Medicine, Vol, 52, November 1985, pp. 685-91.

Goldberg, T. et. al., "Evaluation of Economic Effects of Drug-Product Selection Legislation," Medical Care, Vol 17, No. 4, April 1979, pp. 411-419.

Greenlick, M. and Darsky, B. "A Comparison of General Drug Utilization Under a Drug Prepayment Plan," American Journal of Public Health, Vol. 58, 1968, pp. 2121-2136.

Grindstaff, G., Hirsch, B., and Silverman, H.: Medicare--Use of Prescription Drugs by Aged Persons Enrolled for Supplementary Medical Insurance, 1967-1977. Health Care Financing Program Statistics. HCFA Pub. No. 03080. Office of Research, Demonstrations, and Statistics, Health Care Financing Administration. Washington. U.S. Government Printing Office, Mar. 1981.

Health Care Financing Administration, Office of the Actuary: National health expenditures, 1986-2000. Health Care Financing Review. Vol. 8, No. 4. HCFA Pub. No. 03239. Office of Research and Demonstrations, Health Care Financing Administration. Washington. U.S. Government Printing Office, Aug. 1987.

Koch, H.: Drug utilization in office-based practice, a summary of findings: National Ambulatory Medical Care Survey: United States, 1980. Vital and Health Statistics. Series 13, No. 65. DHHS Pub. No. (PHS) 83-1726. National Center for Health Statistics, Public Health Service. Washington. U.S. Government Printing Office, Mar. 1982.

Koch, H.: Highlights of drug utilization in office practice: National Ambulatory Medical Care Survey, 1985. NCHS Advance Data. No. 134. DHHS Pub. No. (PHS) 87-1250. National Center

for Health Statistics, Public Health Service. Hyattsville, Md., May 19, 1987.

Knapp, D., "Paying for Outpatient Prescription Drugs and Related Services in Third-Party Programs," Medical Care Review, Vol, 28, No. 8, August 1971, pp. 826-859.

LaVange, L. and Silverman, H.: Prescription drug utilization and expenditure patterns of noninstitutional aged Medicare beneficiaries. National Medical Care Utilization and Expenditure Survey. Series B, Descriptive Report No. 12. DHHS Pub. No. 86-20212. Office of Research and Demonstrations, Health Care Financing Administration. Washington. U.S. Government Printing Office, April 1987.

Lazenby, H., Levit, K., and Waldo, D.: National health expenditures, 1985. Health Care Financing Notes. No. 6. HCFA Pub. No. 03232. Office of Research and Demonstrations, Health Care Financing Administration. Washington. U.S. Government Printing Office, Sept. 1986.

Leibowitz, A., Manning, W., and Newhouse, J. The Demand for Prescription Drugs as a Function of Cost-Sharing, A Rand Note, N-2278-HHS, Santa Monica, CA: Rand Corportion, October 1985.

Lingle, E., Kirk, K., and Kelly, W. "The Impact of Outpatient Drug Benefits on the Use and Costs of Health Care Services for the Elderly," Inquiry, Vol. 24, Fall 1987, pp. 203-211.

Lipton, H. and Lee, P. Drugs and the Elderly: Clinical, Social, and Policy Perspectives. Stanford, CA: Stanford University Press, 1988.

Long, S. and Settle, R., "Cutbacks in Medicaid Eligibility Under the Omnibus Budget Reconciliation Act of 1981: Implications for Acess to Health Care Services Among the Newly Ineligible," Report to Health Care Financing Administration, January 1985.

Manning, W. et. al., "Health Insurance and the Demand for Medical Care: Evidence from a Randomized Experiment," American Economic Review, Vol. 77, N0. 3, pp. 251-277.

Newhouse, J., Phelps, C., and Marquis, S., "On Having Your Cake and Eating It Too: Econometric Problems in Estimating the Demand for Health Services," Journal of Econometrics, Vol. 13, August 1980, pp. 365-90.

Phelps, C., and Newhouse, J. Coinsurance and the Demand for Medical Services, Rand Publication R-964-1-OE/NC, Santa Monica, CA: Rand Corportion, 1974.

Reeder, C. and Nelson, A. "The Differential Impact of Copayment on Drug Use in a Medicaid Population," Inquiry, Vol. 22, 1985, pp. 59-72.

Smith, M. and Garner, D., "Effects of a Medicaid Program on Prescription Drug Availabilty and Acquistion," Medical Care, Vol. 12, 1974, pp. 571-581.

Soumerai, S. et. al., "Payment Restriction for Prescription Drugs under Medicaid: Effects on Therapy, Cost, and Equity," New England Journal of Medicine, Vol. 317, No. 9, Aug. 27, 1987, pp. 550-555.

Stuart, B. and Ahern, F., Drug Utilization and Expenditures for Elderly Pennsylvania PACE Beneficiaries: Longitudinal Cohort Analyses. Final Report under HCFA Contract ORD-88-008, The Collaborative Research Program on Pharmaceutical Use Among the Elderly by Medicine, Health, & Aging Project the Pennsylvania State University and Bureau of Pharmaceutical Assistance Pennsylvania Department of Aging the Commonwealth of Pennsylvania. March 1989.

Trapnell, G. and Genuardi, J.: Consumer Expenditures for Prescription Drugs, 1971-1985. Unpublished report.

Pharmaceutical Manufacturers Association. Washington, D.C. Feb. 1987.

Trowbridge, C. Quantity-Price Relationships in Health Insurance. DHEW Pub. No. (SSA)73-11507 (11-72), Social Security Administration, Actuarial Note 79, November 1972.

U.S. Bureau of the Census: 1977 census of retail trade: Merchandise line sales, United States. Report No. RC77-L. Washington. U.S. Government Printing Office, Sept. 1980.

U.S. Bureau of the Census: 1982 census of retail trade: Merchandise line sales, United States. Report No. RC82-I-3. Washington. U.S. Government Printing Office, Aug. 1985.

APPENDIX 1

DATA SOURCES USED IN THIS REPORT

APPENDIX 1: DATA SOURCES USED IN THIS REPORT

In this appendix, the major data sources used in preparation of the cost estimates in Chapter 3 are described. Other sources were consulted as well, as indicated in the discussion of the estimates; information on those sources is found in the reference materials cited.

Pharmaceutical Data Services, Incorporated (PDS) Senior Scripts data base. PDS is a pharmaceutical research and data subsidiary of PCS, Incorporated, one of the largest prescription claims processing companies in the United States. The Senior Scripts data base is a new product of PDS, first available in March of 1989.

The Senior Scripts data base is drawn from pharmacy records. Vendors of pharmacy software provide PDS with individual prescription records from some 1,700 pharmacies across the United States. The 1988 data base used contains in excess of 8 million prescriptions dispensed to about 573,000 customers. Each prescription record includes patient characteristics (age, sex, known third-party coverage), drug characteristics (National Drug Code, Uniform System of Classification Code, generic/brand indicator, form, strength, quantity), pharmacy zip code, date dispensed, stated acquisition cost of the drug

and retail price. The records include customers who paid cash, used third-party plans, or used Medicaid; the record notes which of these options was used for the prescription. A unique identifier attached to each customer in the pharmacy allows the reconstruction of customer activity in that pharmacy; however, there is no way to track people as they move from one pharmacy to another[5].

The data set in its original state tends to overstate consumption of drugs. The pharmacies whose records comprise the Senior Scripts data set are found in disproportionate numbers in the midwest and southeast parts of the United States, areas in which population-based surveys have found higher than average consumption per capita. The data in Table 7 show the extent of this over-representation. To offset the bias, each customer in the PDS data set was assigned a weight equal to the ratio of SMI enrollment and customer count for the appropriate economic division of the Nation.

PDS' Beta Database. The Beta Database are data gathered from over 2.2 million individuals in all 50 States who receive their prescriptions under a third-party reimbursed drug benefit plan.

---

[5] Further, an additional 1.8 million records in the Senior Scripts file were not used because the patient identifier was garbled.

Table 7. Comparison of PDS Senior Scripts customer counts and SMI enrollment by economic division of the United States

States in economic division	Percent of Medicare enrollees	Percent of PDS customers
Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont	5.6%	0.3%
Delaware, DC, Maryland, New Jersey, New York, Pennsylvania	18.8	14.6
Illinois, Indiana, Michigan, Ohio, Wisconsin	16.8	28.3
Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota	7.9	3.9
Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, West Virginia	25.3	48.7
Arizona, New Mexico, Oklahoma, Texas	8.8	2.2
Colorado, Idaho, Montana, Utah, Wyoming	2.3	0.1
Alaska, California, Hawaii, Nevada, Oregon, Washington	14.3	1.8
All States	100.0	100.0

Sample coverage includes a broad range of blue-collar workers, government employees, white-collar workers, retirees and dependents. Individual patients can be tracked across pharmacies and providers and as far back as 1982.

The data set provided by PDS comprised a sample of 1,024 people 65 years of age or older in 1988 (or who became 65 at some point during the year). Judging by the distribution of customers by annual prescriptions, the people in this subset matched closely those of the Senior Scripts set in terms of drug use.

The utility of the Beta Database lies in its ability to provide a relationship between pharmacy customers and prescription users. The 1,024 aged people in the subset used in this analysis presented themselves as 1,558 customers, using an average of 1.5 pharmacies each during the calendar year (Table 8).

Table 8. Number of pharmacies used by a sample of aged third-party card holders, 1988

Number of pharmacies visited	Number of Users	Percent of Users	Number of Customers
1	662	64.6%	662
2	250	24.4	500
3	73	7.1	219
4	26	2.5	104
5	10	1.0	50
7	1	0.1	7
8	2	0.2	16
Total	1,024	100.0	1,558

SOURCE: Health Care Financing Administration
Based on data from PDS Inc Beta Database

National Medical Expenditure Survey (NMES).

NMES was conducted by the National Center for Health Services

Research and Health Care Technology Assessment (NCHSR) in 1987. The survey is population-based and covered a broad range of issues involving the social, economic, and demographic relationships with health care use and expenditure. The nature of the survey is discussed in detail in Appendix 5 of this report.

NMES data were used in the development of aggregate benefit cost estimates for the CDI program wherever appropriate. The use of various data sources in that process is discussed in chapter 3 of this report, but the limitations of NMES data will be discussed here in more depth. This is being done not because the NMES data are not valid; in fact, they shed considerable light upon the relative use of drugs by various groups. It is being done because many policy makers anticipated that the NMES data would be the principal source of data used to update cost estimates for the prescription drug program. Appendix 5 of the report discusses NMES and its limitations in detail. This section emphasizes important caveats identified in Appendix 5 and expands upon comments in the text regarding the applicability of the NMES data for cost estimating purposes.

The most important limitation of the NMES data is that its usefulness for estimating aggregate expenditures or expenditures per capita is severely limited by the nature of

household survey data in general. The discussion below highlights some comparisons between the NMES data and other independent data sources. These comparisons suggest that the NMES data, like most surveys, probably understates aggregate and per capita prescription drug expenditures, primarily because of problems the survey respondents have with recall of their prescription drug expenditures.

Survey data, in general, are not appropriate for estimating aggregates or levels of per capita expenditures. The Survey Research Center at the University of Michigan, in their publication Economic Survey Methods, specifically state that household surveys are not appropriate instruments to estimate either national aggregates or attributes with very skewed distributions. Both the use of prescription drugs and spending for those drugs exhibits a skewed distribution.

As mentioned in Exhibit E-1 of Appendix 5, the problem of respondent recall is likely to be more severe with regard to expenditures paid for by third party sources, because people tend to have better recall of expenditures made out of pocket than of those for which a third party paid.

Table 3 of Appendix 5 indicates a significant discrepancy between the 1977 CMS survey and the 1977 NMCES survey. The NMCES mean annual expenditure is 28 percent lower than the CMS

mean annual expenditure. This could indicate a substantial under-reporting error in the NMCES survey. Based on the discussion of Table 3 in Appendix 5, it would appear that an under-reporting error in the NMCES data would similarly imply an under-reporting error in the NMCUES and NMES surveys, although not necessarily of precisely the same magnitude.

Technical Appendix E of Appendix 5 contains an extensive discussion of the limitations of the NMES data. It points out, for example, that independent data sources that rely upon pharmacy records of volume have produced estimates of total prescriptions dispensed that are as much as 27 percent higher than the NMES data have produced. Technical Appendix E also includes an extensive discussion of the 1975 Medical Economics Survey--Methods Study (MESMS), which documented a 16 percent inaccuracy in survey estimates of drug utilization in Washington County and a 40 percent inaccuracy in survey estimates of drug utilization in Baltimore. Evaluating all the evidence regarding the validity of the NMES data, it was decided that the NMES data, like other survey data, should not be relied upon exclusively in the development of prescription drug cost estimates.

Pennsylvania Pharmaceutical Contract for the Elderly (PACE). PACE is a lottery-financed pharmaceutical assistance program administered by the Pennsylvania Department of Aging.

Eligibility is limited to state residents ages 65 and older who are not enrolled in the State's Medicaid program; in addition, to qualify for the program the enrollee's income must be under $12,000 if single or $15,000 if married. An estimated 45 to 55 percent of elderly Pennsylvanians meet these income criteria. Approximately half of those eligible for benefits apply for and receive PACE coverage. Unlike Medicaid, there are neither asset restrictions nor spend-down requirements.

PACE provides broad and comprehensive outpatient coverage of legend drugs, insulin and insulin syringes. It also provides inpatient coverage for eligible nursing home residents, but given the small numbers involved (less than three percent of total enrollees) PACE remains basically an outpatient drug program. Experimental drugs, drugs listed on HCFA's Drug Efficacy Study Implementation List (DESI) drugs), medical supplies other than syringes, and non-prescription medications are not covered. For medications provided in tablet or capsule form, dosages are limited to the lesser of 30 days supply or 100 units per claim. The PACE cardholder is required to pay a copayment of $4.00 for each prescription received. Participating pharmacies are reimbursed the lower of their usual and customary charge or the average wholesale price plus a dispensing fee of $2.75, less the copayment amount.

Researchers at the University of Pennsylvania, working under contract to HCFA's Office of Research, analyzed data from the PACE program for FY 1985 through FY 1987. In their final report (HCFA Contract ORD-88-33-008), they reported on the use of and expenditure for prescription drugs by various demographic characteristics of beneficiaries. The analysts also compared the experience of three cohorts: those who enrolled in FY 1985, those who enrolled in FY 1986, and those who enrolled in FY 1987. One facet of that comparison, shown in Table 9, is that people who have been in the program longer tend to use more prescriptions.

Table 9. Average number of PACE claims per enrollee, by year and cohort: 1985-1987

Date of Enrollment	Fiscal year 1985	1986	1987
1985	15.95	24.10	25.82
1986		12.50	22.77
1987			10.17

SOURCE: HCFA Contract ORD-88-33-008 Data from the PACE program

Current Medicare Survey (CMS). The CMS was conducted by HCFA (and its predecessor, the Social Security Administration) between 1967 and 1977. About 4,800 aged Medicare enrollees were surveyed by means of a monthly personal interview, during which respondents were asked about the use of medical care and related services during the preceding month. Respondents were

given, and encouraged to use, a diary for keeping track of services. The CMS results were used by HCFA to estimate the distribution of prescription drug charges, and to establish the early end of the trend period. The combination of monthly interviews and long experience with the survey instrument combine to make the CMS estimates very reliable, insofar as household surveys are concerned, with respect to drug use.

APPENDIX 2

RELIABILITY OF ACTUARIAL ESTIMATES

APPENDIX 2: RELIABILITY OF ACTUARIAL ESTIMATES

Chapter 3 of this report develops estimates of per capita prescription drug spending by Medicare beneficiaries. Per capita expenditures for prescription drugs, as the discussion in Chaper 3 indicates, are exceedingly difficult to develop, primarily because of the paucity of comprehensive data relating to prescription drug spending. The data sources which are available are fragmented and each data base has its unique advantages and disadvantages which dictate its appropriate use in the development of reliable cost estimates. Because of the variety of data bases which must be used, extensive judgment must be exercised in interpreting the data and determining its appropriate use. Seeming anomalies and inconsistencies must be resolved using both analytical techniques and professional judgment.

As a result of all of these factors, various data sources which were not used directly were compared, at the appropriate point in the cost estimation process, with estimates being developed using the methodology and data described in Chapter 3. Whenever possible, these data were compared for reasonableness with the estimates being developed. In many cases, direct comparisons were not possible because of differences in the time frame of the data, differences in demographic characteristics of the underlying population,

differences in insured status, and various other factors. These data sources could thus be only indirectly used to document the reliability of the estimates of per capita prescription drug spending. The various data sources used in this manner are discussed in more datail below.

Aggregate Expenditures. Aggregate expenditures implied by the per capita expenditures developed in Chaper 3 were compared for reasonableness with aggregate national prescription drug estimates developed by Trapnell and Genuardi in 1987. The aggregate estimates developed by Trapnell and Genuardi were not disaggregated by age, and estimates were available for 1971 through 1985 only. Because estimates were not available by age, a direct comparison of aggregates was not possible. Instead, the aged share of total outpatient prescription drug expenditures was estimated by dividing the aggregate 1985 actuarial estimate of prescription drug spending by the aged population ($6,289 million) by the 1985 Trapnell-Genuardi estimate of total outpatient prescription drug spending ($20,662 million). This produces an estimate of the aged share of total outpatient prescription drug spending of 30.4 percent. This figure is consistent with the figure of 30 percent which the American Association of Retired People (AARP) developed from its 1986 survey of prescription drug expenditures. Similar calculations of the Medicare population's share of prescription drug expenditures using the Trapnell-Genuardi estimates were

examined for consistency over time. For example, a comparison of the growth in the Medicare population's share of prescription drug expenditures with the Medicare population's share of physician expenditures between 1975 and 1985 shows that the trends are consistent, with the physician expenditure share increasing by 54 percent and the prescription drug share increasing by 52 percent.

Per Capita Expenditures. Per capita expenditures for the aged population were available from a variety of sources. Even though direct comparisons are inconclusive because of differences in demographic makeup, insurance coverage, health characteristics, geographic location, and numerous other

Table 10. Comparison of HCFA estimates of mean drug expenditure by aged enrollees with private insurance plan experience, 1985 and 1986

Insurer and plan year	Plan expenditure per capita	Comparable HCFA estimate per capita
Blue Cross/Blue Shield group plans		
-- Michigan (1986)	$312	$256
-- Illinois (1986)	388	256
-- New York (1986)	380	256
Medicaid (1985)	368	231
New Jersey Pharmaceutical Assistance Program (1986)	380	256
Pennsylvania Pharmaceutical Assistance Contract for the Elderly (1986)	400	256
Traveler's Insurance (1986)	263	256

SOURCE: Health Care Financing Administration
Based on personal contacts with plan underwriters

factors, comparisons for reasonableness can, nevertheless, be instructive. Table 10 compares per capita prescription drug expenditures for various insured populations with the actuarially estimated Medicare per capita prescription drug expenditures. The figures shown are generally higher than the comparable Medicare figures because they were derived from plans providing third-party coverage of prescription drug expenditures, and reflect the impact of induced utilization, whereas the Medicare per capita figures reflect the lower average level of third party coverage for the general Medicare population.

APPENDIX 3

MATHEMATICAL DERIVATION OF COVERED EXPENSES

APPENDIX 3: MATHEMATICAL DERIVATION OF COVERED EXPENSES

Covered expenses are defined to be the aggregate, over all beneficiaries whose spending exceeds the deductible, of expenditures for prescription drugs in excess of that deductible. In mathematical terms, this spending is defined to be:

$$U \int_{k}^{\infty} (x-k)\, f(x)\, dx$$

where U is the number of users, k is the annual deductible and f(x) is the gamma density function. To quantify this expression, it is convenient to introduce three additional measures. The first is the proportion of users who exceed the annual spending limit. This is found by integrating the gamma function from the annual limit through infinity:

$$r = \int_{k}^{\infty} f(x)\, dx$$

The second measure is the proportion of total expenditures accounted for by those people:

$$e = \frac{\int_{k}^{\infty} x\, f(x)\, dx}{\int_{o}^{\infty} x\, f(x)\, dx}$$

The third measure is simply a restatement of the user mean:

$$m = \int_{o}^{\infty} x\, f(x)\, dx$$

With these notations in hand, the expression for total annual covered expenses (before application of an insurance effect) is:

$$U*(e*m - r*k)$$

Table 11 contains the numerical values of these variables for the Medicare populations of 1991 through 1993, assuming a gamma distribution with β=.87 and mean annual prescriptions per user equal to those presented in chapter 3 of this report.

Table 11. Values of e, r, and m, by values of k, from the distribution of prescription drug spending by Medicare enrollees, 1991-1993

	1991		1992		1993	
U	28,135		28,677		29,229	
m	$497		$526		$567	
k	r	e	r	e	r	e
300	0.5250	0.8794	0.5424	0.8895	0.5647	0.9018
350	0.4762	0.8475	0.4944	0.8600	0.5180	0.8751
400	0.4323	0.8145	0.4511	0.8292	0.4756	0.8471
450	0.3928	0.7807	0.4119	0.7975	0.4369	0.8182
500	0.3570	0.7466	0.3763	0.7654	0.4016	0.7887
550	0.3247	0.7125	0.3439	0.7332	0.3694	0.7588
600	0.2955	0.6787	0.3145	0.7011	0.3398	0.7289
650	0.2689	0.6455	0.2877	0.6693	0.3128	0.6991
700	0.2449	0.6128	0.2632	0.6380	0.2880	0.6696
750	0.2231	0.5811	0.2410	0.6073	0.2652	0.6406
800	0.2032	0.5502	0.2206	0.5774	0.2443	0.6121
850	0.1852	0.5203	0.2020	0.5483	0.2251	0.5842
900	0.1688	0.4915	0.1851	0.5201	0.2075	0.5570
950	0.1539	0.4638	0.1696	0.4929	0.1912	0.5305
1,000	0.1404	0.4372	0.1554	0.4666	0.1763	0.5049

SOURCE: Health Care Financing Administration

APPENDIX 4

INDUCED DEMAND FOR PRESCRIPTION DRUGS

APPENDIX 4: INDUCED DEMAND FOR PRESCRIPTION DRUGS

Induced demand associated with the reduction in consumer out-of-pocket payments for health care is an important component of the cost of insurance programs. For highly insured services such as hospital and physician care, there has been substantial research on quantifying induced demand. The research literature notwithstanding, for specific applications, estimating induced demand is very difficult and relies heavily on professional judgement. In the case of a relatively thinly insured category such as prescription drugs, there have been far fewer studies. Few (or none) of the studies may be directly applicable for making a specific estimate of induced demand. Thus the range of uncertainty is higher. Nevertheless, it is the task of actuaries to pull together the available empirical evidence, combine the data with professional judgement, and develop an estimate of induced demand.

This appendix provides background on: (1) the components of induced demand, (2) the behavioral rationale for how and why induced demand comes about, (3) brief reference to some of the studies on induced demand for prescription drugs, (4) the shoebox effect and its relationship to induced demand, and (5) a bibliography of studies related to induced demand.

Components of induced demand. Induced demand results from the reduction or elimination of out-of-pocket consumer spending at the point of purchase through the use of insurance. It is important to note that when the financial liability of the consumer is reduced, other actors in the system can potentially have more important influences on the pattern and magnitude of the induced spending. In the case of prescription drug spending, obviously physicians play a pivotal role. Pharmacists, drug detailers, and pharmaceutical manufacturers may also play important roles in the pattern and magnitude of induced spending, albeit less obviously and less directly.

Induced demand for prescription drugs has several related components: (1) the percent of the newly insured population that utilizes drugs may grow as unmet needs of certain subgroups are satisfied, (2) the number of filled prescriptions per user may expand as compliance is improved due to financial factors, (3) the average size of the prescription may increase as there is less concern about wastage, (4) the average charge per pill of a given type or composition may rise faster than would otherwise be the case as the savings from finding the lowest cost pharmacist diminishes, and (5) the mix of drugs may shift toward more expensive categories. This can result from lowering the price of prescription drugs relative to uncovered over-the-counter drugs and from using higher priced drugs that

are perceived to be higher quality by the physician or patient.

For some dimensions of induced demand, such as meeting previously unmet needs, the greatest impact will be in the early years of the program. For other dimensions of induced spending, the strongest impacts may not show up for years. This could be the case, for example, if drug manufacturers now perceive they have the incentives to redirect a larger portion their research and development efforts toward expensive drugs which may not have been marketable prior to the enactment of catastrophic drug insurance under Medicare.

The insurance context. The prescription drug program of the Medicare Catastrophic Coverage Act of 1988 provides benefits for 33 million Medicare beneficiaries. For most beneficiaries, this coverage provides new benefits that have not been part of most private supplementary insurance. The Act provides for substantial deductibles and coinsurance provisions, as outlined in chapter 1. It is likely that innovative private insurers, in an effort to maintain premium volume, will provide front-end prescription drug coverage just as is now the case for hospital and physician services. Thus, the Medicare coverage of high expenditures may cause a total revamping of basic coverage for drugs, with vastly increased coverage as Medicare high-end coverage is combined with Medigap low-end coverage.

Since much of the Medigap coverage is purchased by individuals rather than groups, it is likely that there will be substantial selection bias in the purchase of front-end drug coverage. That is, individuals who anticipate the need for substantial use of drugs will be more likely to purchase such policies since it is in their financial interest to do so. This will result in induced costs in front-end drug spending with a consequent increased probability of meeting the Medicare catastrophic deductible.

Some proportion of consumers will not be influenced by the lower out-of-pocket cost to modify their pattern of drug use and spending. At the other end of the spectrum, some proportion of consumers will substantially increase their use of drugs. One would expect the majority of consumers to increase their consumption patterns to a moderate degree.

Physicians make decisions on drug use on medical appropriateness grounds, but their decisions may be influenced by the financial impact of the decision on the patient. Thus induced spending can result even when the physician makes the decision. For certain categories of drugs the range of symptoms for which the drug is appropriate may be fairly wide and thus subject to considerable professional judgement. In this case some patients may attempt to obtain the services of a

physician that will better meet their perceived needs for specific quantities and therapeutic categories of drugs.

Studies of induced demand. Numerous studies (cited in the bibliography) have documented that insurance coverage is associated with an increase in the use of and spending for prescription drugs, but there is much uncertainty as to the magnitude of the insurance effect. Previous studies address Canadian, British, and U.S. experience and encompass a wide array of sub-populations, income groups, times, geographic areas, and insurance characteristics. These studies range from econometric analyses with nonexperimental data to natural experiments and randomized experiments. Unfortunately, most of the studies provide only limited and incomplete evidence on which to base an estimate of induced demand for the catastrophic drug insurance program.

Those studies which appear to be based on unbiased data and which use appropriate methodology support the view that insurance is associated with substantial induced spending. For example, the Congressional Budget Office (Ginsburg and Curtis, 1978) surveyed the available studies at the time they were developing cost estimates for national health insurance proposals. Their best estimate was that demand would double when going from no insurance to full insurance. This is equivalent to an induction factor of 1.0. The CBO's judgement

was that a sensible range, given the uncertainty, was from a 50 percent to a 150 percent increase when going from no insurance to full insurance. This translates into induction factors of .5 to 1.5.

HCFA's actuaries have assessed the various studies, and conclude that an induction factor of .6 is not unreasonable. That is, costs would be 60 percent higher when going from no insurance to full insurance. This is near the lower end of the CBO range of induction factors of .5 to 1.5.

It is very important to remember that the induction factor applies only to the portion of cost that was formerly paid out-of-pocket and is now paid for by insurance. For example, suppose a 20 percent coinsurance rate was in effect and a total of $100 was paid by the consumer and the insurance company($20 for consumer and $80 for insurance company) prior to a full coverage plan. After full coverage, the $20 is "transferred" to the insurance company. Thus .6 x $20 = $12. Total spending goes up $12 to $112, an increase of 12 percent in total spending.

Many of the studies did not take into account that prescription drug coverage can potentially be associated with physician spending in the sense that more prescriptions require more physican visits. Technically this can be described as the

cross price elasticity of demand between the price of prescription drugs and the utilization of physician services. As the out-of-pocket price of prescription drugs falls due to increased insurance coverage, the demand for physician services could rise somewhat, all other factors remaining constant.

The shoebox effect. It has been widely observed in prescription drug insurance programs that beneficiaries frequently do not make claims for all prescriptions covered under their insurance. This so-called shoebox effect stems from the need for the beneficiary to submit what are usually small dollar claims to the insurer. Frequently the prescription bills are tossed into a shoebox, but never sent along as a claim on insurance. The dollar return on small claims is evidently not worth the effort of filling out forms and documenting the claims for some beneficiaries.

HCFA actuaries assume no shoebox effect for the Medicare catastrophic drug insurance program. It is anticipated that 90 percent of all claims will be handled electronically, at the point of sale. Clearly, no shoebox effect is possible for these claims. For the remaining claims, a shoebox effect is possible but is probably very small. HCFA actuaries have assumed that this effect will reduce benefit outlays negligibly. As experience with the program is gained, the actuaries may need to revise this assumption.

The negligible impact of the shoebox effect on Medicare outlays simply reflects the fact that the program is designed to operate on a point of service basis. Compared to typical private insurance programs, which are based on paper claim submission, this implies higher outlays. CBO estimated a 15 percent increase in benefit outlays due to point of sale electronic technology rather than the more common after-sale paper claim technology. This amounts to a $370 million outlay increase in 1991.

APPENDIX 5

NATIONAL MEDICAL CARE EXPENDITURES SURVEY REPORT

PRESCRIPTION DRUGS:

USE AND EXPENDITURES BY MEDICARE BENEFICIARIES

APPENDIX 5: NATIONAL MEDICAL CARE EXPENDITURES SURVEY REPORT

PRESCRIPTION DRUGS:
USE AND EXPENDITURES BY
MEDICARE BENEFICIARIES

PRESCRIPTION DRUGS:

USE AND EXPENDITURES BY MEDICARE BENEFICIARIES

Prepared by:

John F. Moeller, Ph.D.
Nancy A. Mathiowetz, Ph.D.
Steven B. Cohen, Ph.D.

Division of Intramural Research

U.S. Department of Health and Human Services
Public Health Service

National Center for Health Services Research
and Health Care Technology Assessment

J. Michael Fitzmaurice, Ph.D., Director

Room 18A-55
5600 Fishers Lane
Rockville, MD 20857
(301) 443-4836

TABLE OF CONTENTS

Chapter			Page
	EXECUTIVE SUMMARY		x
1	INTRODUCTION		1
	1.1	Survey Background	1
	1.2	Definitions, Methods, and Limitations	3
	1.3	Validity of Data	4
	1.4	Reliability of Estimates	4
2	FINDINGS		5
	2.1	The Number and Expenditures for Prescriptions in 1987	5
	2.2	The Distribution of Prescription Expenditures Among Beneficiaries	5
	2.3	Changes Over Time in the Use of Prescription Drugs by Elderly Beneficiaries	7
	2.4	Comparison of NMES Estimates With Those of CBO and HCFA	11
	2.5	Differences in Use and Expenditures Based on Beneficiary Characteristics	11
	2.6	Use of Prescribed Medicines by Therapeutic Function	14
	2.7	Use of Prescribed Drugs by Condition	15
	2.8	Use of Generic Prescribed Medicine	15
3	THE IMPACT OF INSURANCE ON PRESCRIPTION UTILIZATION AND EXPENDITURE		29
	3.1	Summary of Findings	30
	3.2	The Impact of Insurance Coverage on Prescription Use and Expenditures Using NMCES Data	31
	3.3	Utilization Under First Dollar Coverage	37
	REFERENCES		48

TABLE OF CONTENTS
(continued)

List of Appendices

Appendix			Page
A	DEFINITION OF TERMS, MEASURES, AND INDICATORS		A-1
	A.1	Terms Relating to Prescription Medicines and Their Use	A-1
	A.2	Population Characteristics	A-3
	A.3	Medical Conditions	A-6
B	HOUSEHOLD SURVEY SAMPLE DESIGN AND DATA COLLECTION		B-1
	B.1	Household Survey Sample Design	B-1
	B.2	Data Collection	B-3
C	PRESCRIBED MEDICINE CODING AND QUALITY CONTROL		C-1
	C.1	The NAMCS Coding Scheme	C-1
	C.2	NMES Prescription Medicine Coding	C-3
	C.3	Professional Quality Control	C-5
D	DATA EDITING AND IMPUTATION		D-1
	D.1	Data Entry and Batch Editing	D-1
	D.2	Editing	D-2
	D.3	Imputation	D-7
E	VALIDITY OF NMES PRESCRIPTION DATA		E-1
	E.1	Previous Validation Studies of Prescription Medicines	E-2
	E.2	Comparison of NMES Estimates of Utilization and Charges with Other Sources	E-2
	E.3	Comparison with Claims Data	E-19
F	EFFECTS OF PART-YEAR RESPONSE		F-1
	F.1	Estimation Strategies for Part-Year Respondents	F-2
	F.2	Demographic Characteristics	F-4

TABLE OF CONTENTS
(continued)

Appendix		Page
G	WEIGHTS AND VARIANCE ESTIMATION PROCEDURES FOR THE USE OF PRESCRIBED MEDICINES, NMES HOUSEHOLD SURVEY, 1987	G-1
	G.1 Derivation of Sampling Weights and Response Adjustments	G-1
	G.2 Variance Estimation Procedures	G-9
H	RELIABILITY OF ESTIMATES	H-1
I	PRESCRIBED MEDICINE BOOKLET	I-1
J	DATA UNDERLYING THE ESTIMATION OF INDUCED DEMAND FOR THE MEDICARE POPULATION: MEDCO BENEFICIARIES	J-1

List of Tables

Table		Page
1	Annual expenditures on prescribed medicines obtained by noninstitutionalized Medicare beneficiaries (NMES Household Data, 1987)	6
2	Annual expenditures for prescribed medicines obtained by noninstitutionalized Medicare beneficiaries: Percentage distributions and cumulative percent by expenditure intervals (NMES Household Data, 1987)	8
3	Average charges for prescribed medicines obtained by the elderly Medicare population: United States, 1967-1987	9
4	Comparison of 1987 annual expenditures for prescribed medicines obtained by noninstitutionalized Medicare beneficiaries: CBO and HCFA estimates for 1987 and NMES Household Data, 1987	12

TABLE OF CONTENTS
(continued)

Table		Page
5	Prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by selected population characteristics (NMES Household Data, 1987)	16
6	Number of prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by selected population characteristics (NMES Household Data, 1987)	18
7	Annual expenditures for prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by selected population characteristics (NMES Household Data, 1987)	20
8	Prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by therapeutic function and selected population characteristics (NMES Household Data, 1987)	22
9	Prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by major ICD-9 categories and selected population characteristics (NMES Household Data, 1987)	25
10	Prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by generic or brand name classification and selected population characteristics (NMES Household Data, 1987)	27
11	Mean annual expenditures for prescribed medicines and prescriptions obtained by persons 18 to 64 years of age: Estimated impact of basic health insurance coverage (NMCES HIES Data, 1977)	41
12	Mean annual expenditures for prescribed medicines and prescriptions obtained by persons 65 years of age and older: Estimated impact of basic health insurance coverage (NMCES HIES Data, 1977)	42
13	Mean annual expenditures for prescribed medicines obtained by persons 18 to 64 years of age: Estimated impact of major medical insurance coverage (NMCES HIES Data, 1977)	43
14	Mean annual expenditures for prescribed medicines and prescriptions obtained by persons 18 to 64 years of age: Estimated impact of basic and major medical insurance coverage (NMCES HIES Data, 1977)	44

TABLE OF CONTENTS
(continued)

Table		Page
15	Mean annual expenditures for prescribed medicines and prescriptions obtained by persons 65 years of age and older: Estimated impact of basic and major medical health insurance coverage (NMCES HIES Data, 1977)	45
16	Mean number of prescriptions per person: NMES Medicare beneficiaries and Medco beneficiaries 65 years of age and over, 1987	46
17	Annual utilization for Medicare beneficiaries, age 65 and older based on NMES and Medco average number of prescriptions per person	47
B-1	Sample domains and sizes	B-6
B-2	NMES Round One sample	B-7
C-1	Pharmacist review and coding	C-6
E-1	Comparative utilization rates for NMES and PDS: 20 most frequently purchased generic ingredients	E-15
E-2	Comparative utilization rates for NMES and PDS: 20 most frequently purchased generic ingredients among Medicare beneficiaries	E-17
E-3	Comparative charges per prescription for NMES and PDS: 20 most frequently purchased generic ingredients among Medicare beneficiaries	E-20
F-1	Distribution of demographic characteristics of NMES Medicare beneficiary respondents	F-5
F-2	Annual utilization of prescription medicines by Medicare beneficiaries responding full- or part-year	F-7
H-1	Standard errors for Table 1: Annual expenditures on prescribed medicines and prescriptions obtained by noninstitutionalized Medicare beneficiaries (NMES Household Data, 1987)	H-3

TABLE OF CONTENTS
(continued)

Table		Page
H-2	Standard errors for Table 2: Annual expenditures for prescribed medicines obtained by noninstitutionalized Medicare beneficiaries: Percentage distributions and cumulative percent by expenditure intervals (NMES Household Data, 1987)	H-4
H-3	Standard errors for Table 3: Average charges for prescribed medicines and prescriptions obtained by the elderly Medicare population: United States, 1980 and 1987	H-5
H-4	Standard errors for Table 4: Comparison of 1987 annual expenditures for prescribed medicines obtained by non-institutionalized Medicare beneficiaries (NMES Household Data, 1987)	6
H-5	Standard errors for Table 5: Prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by selected population characteristics (NMES Household Data, 1987)	H-7
H-6	Standard errors for Table 6: Number of prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by selected population characteristics (NMES Household Data, 1987)	H-9
H-7	Standard errors for Table 7: Annual expenditures for prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by selected population characteristics (NMES Household Data, 1987)	H-11
H-8	Standard errors for Table 8: Prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by therapeutic function and selected population characteristics (NMES Household Data, 1987)	H-13
H-9	Standard errors for Table 9: Prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by major ICD-9 categories and selected population characteristics (NMES Household Data, 1987)	H-16
H-10	Standard errors for Table 10: Prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by generic or brand name classification and selected population characteristics (NMES Household Data, 1987)	H-18

TABLE OF CONTENTS
(continued)

Table		Page
H-11	Standard errors for Table 11: Mean annual expenditures for prescribed medicines and prescriptions obtained by persons 18 to 64 years of age: Estimated impact of basic health insurance coverage (NMCES HIES Data, 1977)	H-20
H-12	Standard errors for Table 12: Mean annual expenditures for prescribed medicines and prescriptions obtained by persons 65 years of age and older: Estimated impact of basic health insurance coverage (NMCES HIES Data, 1977)	H-21
H-13	Standard errors for Table 13: Mean annual expenditures for prescribed medicines and prescriptions obtained by persons 18 to 64 years of age: Estimated impact of major medical insurance coverage (NMCES HIES Data, 1977)	H-22
H-14	Standard errors for Table 14: Mean annual expenditures for prescribed medicines and prescriptions obtained by persons 18 to 64 years of age: Estimated impact of basic and major medical insurance coverage (NMCES HIES Data, 1977)	H-23
H-15	Standard errors for Table 15: Mean annual expenditures for prescribed medicines and prescriptions obtained by persons 65 years of age and older: Estimated impact of basic and major medical health insurance coverage (NMCES HIES Data, 1977)	H-24
H-16	Standard errors for Table 16: Mean number of prescriptions per person: NMES Medicare beneficiaries and Medco beneficiaries 65 years of age and over, 1987	H-25

List of Exhibits

Exhibit		
E-1	Evaluation by Stanley Presser	E-3
E-2	Evaluation by Barbara A. Bailar	E-8

EXECUTIVE SUMMARY

The 1987 National Medical Expenditure Survey (NMES), a project of the National Center for Health Services Research and Health Care Technology Assessment (NCHSR), collected information on how Americans use health services and what they pay for care. The Medicare Catastrophic Coverage Act of 1988 requires that the Secretary, Department of Health and Human Services, use these data to inform Congress on the expenses incurred by Medicare beneficiaries for outpatient prescription drugs. This report, based on NMES data, provides estimates of use of and expenditures for prescriptions obtained by noninstitutionalized Medicare beneficiaries. Estimates of induced demand based on two additional data sets are also included.

The data used in this report are from the Household Survey Component (HHS) of NMES. The HHS sample is designed to produce unbiased national estimates for the civilian, noninstitutionalized population. The results presented in this report are based on information on the elderly, noninstitutionalized Medicare beneficiaries and those less than 65 years of age who received Medicare benefits because of disability or end-stage renal disease. The estimates employ data from all individuals covered by Medicare at any time in 1987; they take into account only prescriptions purchased or obtained when the sample person was a Medicare beneficiary. The findings include estimates of use and expenditures by totals, means, and percentage distributions for Medicare beneficiaries.

Highlights of the findings are:

- In 1987, noninstitutionalized Medicare beneficiaries purchased or obtained 486.6 million prescriptions. The expenditures associated with these prescriptions totaled $8.3 billion.
- Eighty-two percent of Medicare beneficiaries purchased at least one prescription during the year.
- On average, Medicare beneficiaries purchased 15.3 prescriptions and incurred $262 in expenditures; nonelderly beneficiaries averaged 21.8 prescriptions and $405 in associated costs as compared to 14.7 prescriptions and $248 among elderly beneficiaries.
- The precise expenditure level exceeded by 16.8 percent of the beneficiaries was $506.

- Based on the Consumer Price Index for 1987 and 1989, the $600 deductible for 1991 can be deflated to an equivalent value of $450 in 1987 prices. Approximately 20 percent of the noninstitutionalized Medicare beneficiaries had expenditures in 1987 in excess of $450.

- The 5 percent of Medicare beneficiaries with the highest expenditures account for 25 percent of the expenditures on prescribed medicines by the noninstitutionalized Medicare population.

- Estimates of 1987 expenditures for Medicare beneficiaries by the Congressional Budget Office are somewhat lower than estimates using NMES data; the CBO estimate of average annual expenditures for beneficiaries in 1987 was $233 as compared to the NMES estimate of $262. CBO estimated that 13.4 percent of beneficiaries would exceed annual expenditures of $500; the NMES estimate was 17.1 percent.

- Total annual expenditures of noninstitutionalized Medicare beneficiaries with expenditures in excess of $500 was estimated to be $4.2 billion according to CBO and $4.8 billion according to NMES.

- Total annual expenditures exceeding the $500 deductible level for only the elderly noninstitutionalized Medicare population are estimated at $4.0 billion according to NMES.

- Trends for elderly Medicare beneficiaries indicate an increase in utilization from 12.1 prescriptions per beneficiary in 1980 to 14.7 in 1987; inflation accounts for most of the changes in charges per prescription ($8.05 vs. $16.89) and for the increase in average annual expenditures per person ($98 vs. $248) during the same period.

- On average, women obtained approximately 18 percent more prescriptions than men (16.4 and 13.9, respectively) during 1987.

- Individuals reporting difficulty with one or more Activities of Daily Living had 70 to 87 percent more prescriptions than those with no difficulty.

- Over 50 percent of individuals who reported difficulty with two or more Activities of Daily Living or who perceived themselves to be in poor health utilized 21 or more prescriptions during 1987.

- Highest average prescription use was in the South (16.3); the lowest was in the West (14.0).

- Over 48 percent of the prescriptions obtained by Medicare beneficiaries were for either cardiovascular agents or central nervous system medications.

- Almost 25 percent of all prescriptions were generic.

- With respect to the question of the extent to which Medicare payment for prescriptions may affect utilization ("induced demand") estimates using 1977 National Medical Care Expenditure Survey data indicate that there were no

significant differences in average prescription use or expenditures between insured persons who had prescription drug coverage and those who did not.

- The 1977 data also show that for those persons with prescription insurance coverage, there was no relationship between generosity of the cost-sharing features of the prescription drug plan and average prescription use and expenditures.

- Data from a secondary source suggest that the upper bound for induced demand, when elderly patients have first dollar coverage and are atypical high users of prescription drugs, is 30 percent. The Medicare Catastrophic Coverage Act, in contrast to first dollar coverage, has both a large deductible and coinsurance rate.

1. INTRODUCTION

The Medicare Catastrophic Coverage Act of 1988 (P.L. 100-360) will result in major changes in the sources of payment of prescribed medicines for Medicare beneficiaries. Of concern at the time the Act was signed into law was the accurate assessment of the current utilization of prescriptions by the Medicare population and the extent to which Medicare payment for prescriptions might affect their utilization (a phenomenon known as "induced demand"). As part of the legislation, the Secretary of Health and Human Services was requested to report to Congress "on expenses incurred by Medicare beneficiaries for outpatient prescription drugs" using data from the National Medical Expenditure Survey. This report contains estimates of use of and expenditures for prescriptions obtained by noninstitutionalized Medicare beneficiaries in 1987 based on NMES data. Estimates of the level of induced demand based on two additional data sets are also provided.

1.1 Survey Background

The 1987 National Medical Expenditure Survey (NMES), a project of the National Center for Health Services Research and Health Care Technology Assessment (NCHSR), provides information on how Americans use health services and what they pay for care. The 1987 NMES is the latest in a series of large, national health expenditure surveys and was designed specifically to generate data for evaluating Federal health policies and programs. Data from two earlier and similar projects were used extensively in designing the various benefits included in the Medicare Catastrophic Coverage Act of 1988.[1]

The 1987 NMES has a number of major components. The primary component and the one most essential in developing this report is the national probability sample of the civilian, noninstitutionalized population. To facilitate analyses for Federal health policy, the Household Survey Component (HHS) of NMES has a larger number of individuals known to be at risk of

[1]The 1977 National Medical Care Expenditure Survey (NMCES) and the 1980 National Medical Care Utilization and Expenditure Survey (NMCUES).

needing or using health services than would be obtained with a random sample of the population. Included in this group are poor and low income families, black and Hispanic minorities, the elderly, and the chronic functionally disabled. The American Indian and Alaska Native populations living on or near reservations and eligible to receive care from the Indian Health Service are included in NMES as a separate household sample. The data for the American Indian and Alaska Native population have not been analyzed in this report.

To augment information obtained from households, data are also being obtained from employers and insurers of household respondents and from hospitals, physicians, and home health agencies that provided care. The other major components of NMES include the population resident in or admitted to nursing homes and homes for the mentally retarded. A Medicare Record Component will supplement claims information for all Medicare beneficiaries including those in the institutionalized population.

The HHS sample is designed to produce unbiased national estimates for the civilian, noninstitutionalized population. NMES collected data from approximately 15,000 households and about 37,000 persons. Respondents were interviewed five different times between February 1987 and July 1988 (each interview is referred to as a survey "round"). In the course of these interviews, respondents answered questions about the use of and charges for care, health insurance coverage, employment, income, and related characteristics of survey participants for the reference period, calendar year 1987. The interviews were conducted in person in Rounds 1, 2, and 4 and usually by telephone in Rounds 3 and 5. The core interview for each round involved questions related to health care use, expenditures, and financing. Supplemental questionnaires were used to obtain information on functional status, use of long-term care services, usual source of medical care, and income. A self-administered questionnaire provided information on health status and health habits. In Round 5, the last round, the questions focused on income tax filing status, day care for children, and maternal and child health care.

To derive the NMES sample, a screening interview was conducted in the Fall of 1986 in more than 35,000 households. The overall response rate for the survey, including the screening round and four rounds of interviews, calculated as the product of individual round response rates, was 79.9 percent.

1.2 Definitions, Methods, and Limitations

The results presented in this report are based on information on the elderly, noninstitutionalized Medicare beneficiaries and those less than 65 years of age who received Medicare benefits because of disability or end-stage renal disease. The estimates employ data from all individuals covered by Medicare at any time in 1987; they take into account only prescriptions purchased or obtained when the sample person was a Medicare beneficiary.

The terms "prescription" or "prescribed medicine" are used in this report to refer to any drug, medication, or biological agent prescribed by a physician. To obtain this information, NMES respondents were asked to report all medications bought or obtained and all prescriptions refilled (See Appendix I for the survey instrument used). Respondents provided information on the name of the prescription, the number of times it was obtained or purchased, and the total charges for each. Counts of the number of prescriptions reported here refer to new prescriptions as well as refills; the counts also include prescription medicines obtained free of charge. Prescription charges or expenditures refer to the total charge, including charges paid by sources other than the family such as insurance. Prescribed medicines provided without charge are included in the estimates of utilization and expenditures.

Only prescriptions obtained on an outpatient basis are included in this report. It was not possible to exclude from the estimates prescriptions not covered under the legislation such as prescriptions purchased through a rural health clinic, associated with hospice care, or prescribed by a nurse-midwife service. NMES also did not collect information concerning the size of a prescription, the dosage, or compliance.

The major findings in this report include estimates of use and expenditures by totals, means, and percentage distributions for noninstitutionalized Medicare beneficiaries. These estimates are reported by age, gender, income, employment, insurance coverage, education, perceived health status, functional disability, and U.S. Census Region (Definitions of each classification are presented in Appendix A).

1.3 Validity of Data

Like other data collected from household respondents, the data from NMES are subject to error which may affect their validity, that is the degree to which the data correspond to the true number of prescriptions purchased by the noninstitutionalized Medicare population. Comparisons between NMES data and data collected directly from pharmacies suggest that the medications most frequently purchased by Medicare beneficiaries are relatively well reported when compared to commercial sources. Detailed discussion of the comparison is presented in Appendix E.

1.4 Reliability of Estimates

Standard errors of all estimates are presented in Appendix H. Differences between estimates for population subgroups were tested at the 95 percent confidence level using Z-scores having asymptotic normal properties. Unless otherwise noted, only statistically significant differences between estimates are discussed in the text. However, not all statistically significant comparisons that could be made are discussed in the text.

2. FINDINGS

2.1 The Number And Expenditures For Prescriptions in 1987

Data from the National Medical Expenditure Survey (NMES) show that noninstitutionalized Medicare beneficiaries purchased or otherwise obtained a total of 486.6 million prescribed medications during 1987 at a total cost of $8.3 billion. This represents on average 15.3 prescriptions for each of these beneficiaries and an average annual cost of $262. These estimates are based on 31.8 million noninstitutionalized beneficiaries including those who qualify for Medicare benefits because of a disability or end-stage renal disease as well as age (Table 1).

2.2 The Distribution of Prescription Expenditures Among Beneficiaries

Based on the NMES data, there were 31.8 million noninstitutionalized beneficiaries in 1987; 29.1 million were elderly and 2.7 million were less than 65 years of age. These groups differed substantially in their use and expenditures for prescription drugs. On average, the elderly beneficiaries obtained 14.7 prescriptions annually; those beneficiaries less than 65 obtained 21.8 prescriptions on average. For the elderly, the average annual expenditure was $248. The expenditure for those under 65 years of age was $405, or roughly 63 percent greater (Table 1).

When one looks at the use of prescribed medicines for the entire noninstitutionalized Medicare population, the NMES data show that the 5 percent of noninstitutionalized beneficiaries with the largest expenditures accounted for more than one-quarter of total expenditures. This distribution is important in the context of the Medicare Catastrophic Coverage Act of 1988; coverage of outpatient prescribed medicines is limited to those beneficiaries who have the largest expenditures.

When the prescription drug benefit becomes available to Medicare beneficiaries in 1991, the deductible -- the amount that must be spent by the individual before being eligible for Medicare funds -- will be $600. This deductible will increase to $652 in 1992. Each year thereafter

Table 1. Annual expenditures on prescribed medicines obtained by noninstitutionalized Medicare beneficiaries (NMES Household Data, 1987)

Population characteristics	Total beneficiaries		Prescribed medicines		Prescribed medicines expenditures		Mean number of prescribed medicines per beneficiary	Mean annual expenditure per beneficiary
	Number (in thousands)	Percent	Number (in millions)	Percent	Total (in millions)	Percent		
Total[a]	31,801.5	100.0	486.6	100.0	$ 8,318.4	100.0	15.3	$ 261.6
Elderly Medicare beneficiaries[a]	29,081.1	91.4	427.3	87.8	7,216.2	86.7	14.7	248.1
Medicare beneficiaries under 65 years of age	2,720.5	8.6	59.3	12.2	1,102.2	13.3	21.8	405.2

[a]Includes persons who were 64 years old on January 1, 1987 and turned 65 during the year. Data on prescribed medicines for these persons and all other individuals not covered by Medicare for the entire year are only included for the period of time during 1987 during which they were Medicare beneficiaries.

Note: Standard error estimates are presented in Table H-1 in Appendix H.

SOURCE: National Center for Health Services Research and Health Care Technology Assessment, National Medical Expenditure Survey

it will be changed to ensure that no more than 16.8 percent of beneficiaries will have expenses that exceed the deductible.

The NMES data indicate that in 1987, using the 16.8 percent criterion, the deductible would have been set at $506. That year, 17.1 percent of the Medicare population had annual prescription drug expenses in excess of $500; but they accounted for 58.1 percent ($4.8 billion) of the total prescription expenditures for noninstitutionalized beneficiaries (Table 2).

The NMES data would suggest the $600 deductible may have been set somewhat low, given the intent to limit benefits to 16.8 percent of the noninstitutionalized Medicare population. Based on the annual changes in the Consumer Price Index (CPI) for prescription drugs between 1987 and 1989, the inflation rate for prescribed medicines has recently been averaging 7.8 percent per year.[2] Using this inflation rate, the $600 deductible can be deflated to an equivalent value of $450 in 1987 prices. The NMES data displayed in Table 2 show that 19.6 percent of the noninstitutionalized Medicare population had expenditures in 1987 in excess of $450. At this level an additional 782,000 persons would have been eligible for benefits. The total expenditures for the group with expenses exceeding the deductible would increase by $369.3 million or 4.4 percent of the total prescription expenses of Medicare beneficiaries in 1987.

2.3 Changes Over Time in the Use of Prescription Drugs by Elderly Beneficiaries

A recent report on the use of and expenditures for prescribed medicines by the noninstitutionalized elderly Medicare population provides a basis for looking at changes between 1967 and 1980 (LaVange and Silverman, 1987). Data from NMES have been added to the table presented in this earlier study to reflect the long term trends (Table 3).

Looking only at information for elderly noninstitutionalized Medicare beneficiaries, data from NMES reveal there was an increase in the average number of prescriptions for this group between 1980 and 1987. Based on data from the National Medical Care Utilization and Expenditure Survey, the average number of prescriptions for elderly beneficiaries was 12.1 in 1980.

---

[2]Estimates of recent inflation rates are based on the CPI for prescriptions which was 152.0 for 1988, 147.8 for February 1988, and 159.0 for February 1989, the most recent value of the index available for this report (U.S. Department of Labor, Bureau of Labor Statistics, Monthly Labor Review). The inflation rate for prescribed medicines has been averaging approximately 7.8 percent per year.

Table 2. Annual expenditures for prescribed medicines obtained by noninstitutionalized Medicare beneficiaries: Percentage distributions and cumulative percent by expenditure intervals (NMES Household Data, 1987)

Annual expenditures	Beneficiaries			Annual expenditures		
	Total (in thousands)	Percent	Cumulative percent	Total (in millions)	Percent of total	Cumulative percent
Total	31,801.5	100.0	-	$ 8,318.4	100.0	-
$ 0	5,810.7	18.3	18.3	0	0	0
1-50	4,874.0	15.3	33.6	121.1	1.5	1.5
51-100	3,506.0	11.0	44.6	256.7	3.1	4.5
101-150	2,519.7	7.9	52.5	315.0	3.8	8.3
151-200	2,172.7	6.8	59.4	381.6	4.6	12.9
201-250	1,962.5	6.2	65.5	442.6	5.3	18.2
251-300	1,495.1	4.7	70.2	412.7	5.0	23.2
301-350	1,311.2	4.1	74.4	426.4	5.1	28.3
351-400	1,063.3	3.3	77.7	398.0	4.8	33.1
401-450	857.5	2.7	80.4	362.8	4.4	37.5
451-500	782.3	2.5	82.9	369.3	4.4	41.9
501-550	735.6	2.3	85.2	385.7	4.6	46.5
551-600	630.0	2.0	87.2	360.9	4.3	50.9
601-650	547.4	1.7	88.9	342.6	4.1	55.0
651-700	444.4	1.4	90.3	300.3	3.6	58.6
701-750	343.6	1.1	91.4	249.8	3.0	61.6
751-800	395.0	1.2	92.6	306.5	3.7	65.3
801-900	505.8	1.6	94.2	429.6	5.2	70.5
901-1,000	395.1	1.2	95.4	375.9	4.5	75.0
1,001-1,200	597.5	1.9	97.3	650.1	7.8	82.8
1,201-1,500	442.6	1.4	98.7	587.7	7.1	89.9
1,501 or more	409.4	1.3	100.0	843.2	10.1	100.0

Note: Standard error estimates are presented in Table H-2 in Appendix H.

SOURCE: National Center for Health Services Research and Health Care Technology Assessment, National Medical Expenditure Survey

Table 3. Average charges for prescribed medicines obtained by the elderly Medicare population: United States, 1967-1987

Year	Percent of elderly Medicare population using prescribed medicines	Mean number of prescribed medicines per elderly Medicare person	Mean annual expenditure per elderly Medicare person	Mean expenditure per prescribed medicine
1967[a]	77.7	10.4	$ 41.10	$ 4.00
1968	75.3	11.2	45.40	4.10
1969	76.8	10.1	49.70	4.00
1970	78.0	13.1	56.10	4.30
1971	76.5	12.3	55.40	4.50
1972	77.8	13.1	59.40	4.50
1973	80.2	13.4	63.40	4.70
1974	80.0	14.1	70.60	5.00
1975	79.5	13.7	76.80	5.60
1976	80.9	14.1	85.30	6.00
1977	80.6	14.4	95.70	6.60
1977[b]	75.2	10.7	69.20	6.58
1980[c]	80.1	12.1	97.68	8.05
1987[d]	82.1	14.7	248.14	16.89

[a]Data for 1967-77 are from CMS (Grindstaff et al., 1981) and include institutionalized Medicare beneficiaries.

[b]Data are from NMCES, 1977 (Kasper, 1982) for all noninstitutionalized persons 65 years of age or over.

[c]Data for 1980 are from NMCUES for noninstitutionalized aged Medicare beneficiaries. Data for 1967-80 in this table are also published in LaVange and Silverman, 1987.

[d]Data are from NMES, 1987 for all noninstitutionalized Medicare beneficiaries 65 years of age or over. Includes persons who were 64 years old on January 1, 1987 who turned 65 during the year. Data on prescribed medicines for these persons are included only for the period of time during 1987 that they were Medicare beneficiaries. The mean expenditure per prescription from NMES data includes prescriptions filled without charge.

Note: Standard error estimates for the 1980 and 1987 data only are presented in Table H-3 in Appendix H.

SOURCE: National Center for Health Services Research and Health Care Technology Assessment, National Medical Expenditure Survey

The NMES data show the average number of prescriptions was 14.7 in 1987 - an increase of 21.5 percent.

Not all elderly noninstitutionalized Medicare beneficiaries use prescription drugs in the course of the year. In 1987, 82.1 percent of the elderly beneficiaries used at least one prescribed medicine. This percentage is 2 percentage points higher than the 1980 estimate. The difference, however, is not statistically significant.

On the other hand, a comparison of data from these two surveys shows that the average cost per prescription rose from $8.05 to $16.89 between 1980 and 1987. This change represents an average annual increase of 11.2 percent. For the same period, the CPI showed the cost per prescription increased an average of 9.9 percent annually, or a total of 94.2 percent.[3] The 1.3 percentage point difference in the annual rate of increase between NMES and the CPI inflation estimate for prescription medicines may reflect, in part, an increase in the average prescription size and the introduction of new and higher priced drugs into the market.[4]

Largely because of this price inflation, the average annual expenditures for prescribed drugs by the elderly Medicare population increased from $98 to $248. This increase represents an average annual rate of 14.2 percent between 1980 and 1987.

The 3 percentage point difference between the increase in the average annual per capita expenditure (14.2 percent) and the average annual increase in the cost of a prescription (11.2 percent) is attributable in part to the increase in the average number of prescriptions obtained by Medicare beneficiaries between 1980 and 1987 (from 12.1 to 14.7 prescriptions).

---

[3]The Consumer Price Indices (CPI) for prescription medicines for 1980 and 1987 were 72.5 and 140.8, respectively, with the 36-month period between 1982 and 1984 as a baseline (U.S. Department of Labor, Bureau of Labor Statistics (BLS) Monthly Labor Review). These CPI measures were the same for the U.S. city average for wage earners and clerical workers and for the index for all U.S. urban consumers published by the BLS.

[4]The prices of new drugs are typically not reflected in the CPI immediately after they reach the marketplace. According to the BLS, new prescription items that substitute for old ones in the CPI replace the old ones only when they reach a critical volume in the marketplace. Otherwise new prescribed medicines are included in the CPI only when the weights for the index are revised every five to ten years.

2.4 Comparison of NMES Estimates With Those Of CBO and HCFA

During the deliberations on the Medicare Catastrophic Coverage Act, the Congressional Budget Office (CBO) and the Health Care Financing Administration (HCFA) developed estimates of the use of and expenditures for prescription drugs in 1991. These estimates were based on data from a variety of sources and in some cases from information obtained early in this decade. In order to compare estimates based on the NMES data with estimates developed by CBO and HCFA, these agencies were asked to provide new but similar estimates adjusted to reflect use and expenditures for noninstitutionalized Medicare beneficiaries in 1987. The Congressional Budget Office was able to provide this information; the data were not available from HCFA (Table 4).

The CBO estimate of the average annual expenditure for prescription drugs for noninstitutionalized Medicare beneficiaries adjusted to reflect 1987 is $233. This estimate is 11.1 percent less than the estimate of $262 based on the NMES data. Using $500 as the deductible level in 1987, the adjusted CBO estimate shows that 13.4 percent of beneficiaries would have expenses above the deductible. The comparable estimate from NMES is 17.1 percent. The CBO estimate of the total annual expenditures exceeding the $500 deductible in 1987 are lower than estimates based on NMES data. The CBO estimate of $4.163 billion is 13.8 percent lower than the estimate of $4.832 billion based on NMES data. NMES data also provided in Table 4 indicate that, for elderly beneficiaries, the total annual expenditures exceeding the $500 deductible are estimated at $4.0 billion.

2.5 Differences in Use and Expenditures Based on Beneficiary Characteristics

Use and expenditures for prescription drugs vary with the characteristics of noninstitutionalized Medicare beneficiaries. These variations are useful in understanding who may be helped by the prescription drug benefit and at what cost. Detailed information on the use of prescribed medicines by selected characteristics of the beneficiary population is presented in Tables 5, 6, and 7.

The probability of obtaining at least one prescription during the year, the average number of prescriptions, and the average annual expenditures for prescription drugs all increased

Table 4. Comparison of 1987 annual expenditures for prescribed medicines obtained by noninstitutionalized Medicare beneficiaries: CBO and HCFA estimates for 1987 and NMES Household Data, 1987

Source	Average annual expenditure per beneficiary	Percentage of beneficiaries with annual expenditures over $500	Total annual expenditures of beneficiaries with annual expenditures over $500 (in millions)
CBO[a]			
Total	$233	13.4	$4,163
NMES[b]			
Elderly	248.1	15.9	3,985.3
Total	261.6	17.1	4,832.3
HCFA[c]	_[c]	_[c]	_[c]

[a]Data provided by the Congressional Budget Office.

[b]Data from the NMES Household Survey, 1987.

[c]Data were not available from the Health Care Financing Administration.

*Relative standard error for NMES data is equal to or greater than 30 percent.

Note: Standard error estimated for the 1987 NMES data only are presented in Table H-4 in Appendix H.

SOURCE: Congressional Budget Office and National Center for Health Services Research and Health Care Technology Assessment, National Medical Expenditure Survey

with age for the population between 65 and 84. The situation was somewhat different for those over 85 years in part because of the absence of institutionalized Medicare individuals who are heavily represented in this oldest age group (Van Nostrand et al., 1979).[5]

This pattern of change in use with age was similar for both males and females. However, females had a significantly higher utilization of prescribed medicines than males. The NMES data show that females obtained, on average, approximately 18 percent more prescriptions than males and incurred an average of 10 percent more expenses than men during 1987 ($272 compared with $247).

Medicare beneficiaries who had difficulty with one or more Activities of Daily Living (ADLs) or who were in poor or fair health as measured by self-reported health status had significantly greater prescription drug use. Persons reporting difficulty with only one ADL obtained, on average, 70 percent more prescriptions than those with no ADL limitations (23.8 prescriptions compared with 14.0). Those having difficulty with two or more ADLs had, on average, 87 percent more prescriptions filled than those with no problems (26.2 vs. 14.0). Persons who perceived themselves as being in poor health had, on average, about six times both the number of prescriptions (31.1 as compared to 5.1) and expenditures ($520 compared to $90) as those in excellent health.

More than 50 percent of the Medicare beneficiaries who were in poor health or who reported difficulties with 2 or more ADLs had 21 or more prescriptions filled during the year. Approximately one-quarter of the Medicare beneficiaries with self-reported poor health and about one-fifth of persons with difficulties with 2 or more ADLs spent more than $700 on prescribed medicines in 1987. This level of expenditure was reached by only 1.2 percent of those reporting excellent health and by only 8.4 percent of those reporting no difficulties with ADLs.

The use of prescribed medicines by noninstitutionalized Medicare beneficiaries declined as family income increased. The percentage of beneficiaries who had at least one prescription during the year was greatest for persons in families with incomes near or below the poverty line. Those in poverty had 5.8 more prescriptions filled during the year than beneficiaries

---

[5]The 85 and older age group in NMES also had the largest proportion of part-year Medicare eligibles due to death and institutionalization.

in the highest income group. The poor had an average annual expenditure for prescription drugs of $299 compared with $245 for the wealthy. More than 12.4 percent of the Medicare beneficiaries below the poverty line had expenditures in excess of $700; this was true for only 8.9 percent of the highest income group of beneficiaries.

The NMES data show that Medicare beneficiaries reporting Medicaid coverage, on average, obtained 55 percent more prescriptions (20.9) than beneficiaries with only Medicare coverage (13.5). They had average annual prescription expenditures of $339, which was 60 percent greater than the $212 reported by those without supplemental coverage. Information is not yet available from NMES on beneficiaries with and without coverage of prescribed medicines in their private health insurance plans or the variations in coverage between Medicaid plans. Therefore, it was not possible to examine directly how supplementary coverage of prescriptions might affect use and expenditures.[6]

Medicare beneficiaries living in the South averaged more prescriptions during the year (16.3) than persons living in the West (14.0). More than 29 percent of the noninstitutionalized Medicare beneficiaries in the South obtained in excess of 21 prescriptions during 1987. The comparable percentage for those in the West was 23.3 percent.

Other findings with respect to how prescription use and expenditures vary by the characteristics of Medicare beneficiaries can be found in Tables 5, 6, and 7.

2.6 Use of Prescribed Medicines by Therapeutic Function

The prescriptions classified as cardiovascular medicines (29.1 percent) and central nervous system medicines (19.3) together accounted for almost one-half of the 487 million prescriptions obtained by the noninstitutionalized Medicare population in 1987. The other 50 percent was distributed among the remaining 8 categories of therapeutic functions identified in

---

[6]The NMES Health Insurance Plan Survey (HIPS) will contain information on coverage of prescribed medicines under private health insurance plans and will enable such an analysis when these data become available in the future. See Chapter 3 of this report for further discussion and analysis of this topic with other data sources. Note that the comparisons of prescription expenditures involving Medicare enrollees with Medicaid coverage are affected by the imputation procedure in NMES for charges for prescribed medicines purchased by these individuals – see Appendix D.

Table 8, which illustrates how the use of prescribed drugs classified by therapeutic function differs by the characteristics of the Medicare population.

2.7 Use of Prescribed Drugs by Condition

Diseases of the circulatory system were most often cited by household respondents as the reason for obtaining a prescription (39 percent) followed by endocrine disorders (10 percent). The distributions of prescriptions by conditions were in general not affected by family income, poverty status, health insurance status, employment, and education (Table 9).

2.8 Use of Generic Prescribed Medicine

Almost one-fourth of the prescriptions purchased by the noninstitutionalized Medicare population were generic prescribed medicines. The percentage distribution between generic and brand name prescriptions appears in Table 10 for subgroups of the Medicare beneficiaries defined by various population characteristics. The use of generic prescriptions varied by family income, poverty status, health insurance status, and education of Medicare beneficiaries. Beneficiaries in families below the poverty line used a higher percentage of generic medicines (27.0) compared with those in families with incomes more than 4 times the poverty levels (23.3) Persons with Medicare coverage only, or with both Medicaid and Medicare coverage, obtained a higher percentage of generic prescriptions (28.8 and 29.8 percent, respectively) than Medicare beneficiaries with private health insurance (23.3 percent).

Table 5. Prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by selected population characteristics (NMES Household Data, 1987)

Population characteristics	Total beneficiaries (in thousands)	Percent beneficiaries without prescribed medicines	Percent beneficiaries with at least one prescribed medicine	Mean prescribed medicines per beneficiary	Mean prescribed medicines per beneficiary with at least one prescribed medicine
Total[a]	31,801.5	18.0	82.0	15.3	18.7
Age in Years					
Less than 65	4,380.9	22.5	77.5	17.1	22.1
65 to 69	9,344.9	21.6	78.4	13.2	16.9
70 to 74	7,458.9	17.5	82.5	15.5	18.8
75 to 79	5,171.3	14.5	85.5	15.7	18.4
80 to 84	3,265.0	11.6	88.4	17.9	20.3
85 or older	2,180.6	12.6	87.4	14.7	16.8
Age and Gender					
Male	13,565.8	21.3	78.7	13.9	17.6
Less than 65	2,284.3	26.0	74.0	16.9	22.8
65 to 69	4,212.0	22.9	77.1	12.0	15.5
70 to 74	3,184.5	20.7	79.3	13.8	17.3
75 to 79	2,077.4	17.4	82.6	13.5	16.3
80 to 84	1,126.0	18.4	81.6	15.9	19.5
85 or older	681.6	15.1	84.9	13.5	15.9
Female	18,235.7	15.5	84.5	16.4	19.4
Less than 65	2,096.6	18.6	81.4	17.4	21.4
65 to 69	5,132.8	20.6	79.4	14.3	18.0
70 to 74	4,274.4	15.1	84.9	16.9	19.9
75 to 79	3,093.9	12.6	87.4	17.2	19.7
80 to 84	2,139.0	8.1	91.9	19.0	20.6
85 or older	1,499.0	11.5	88.5	15.2	17.2
Difficulties with Activities of Daily Living					
None	27,812.3	19.2	80.8	14.0	17.4
One	1,660.3	8.5	91.5	23.8	26.0
Two or more	2,003.5	8.2	91.8	26.2	28.6
Perceived Health Status					
Excellent	2,689.3	39.0	61.0	5.1	8.4
Good	12,462.0	22.8	77.2	9.9	12.8
Fair	10,774.3	10.5	89.5	18.8	21.0
Poor	4,052.6	5.7	94.3	31.1	33.0
Ethnic/Racial Background					
White	27,279.4	17.5	82.5	15.4	18.7
Black	2,913.1	20.3	79.7	15.5	19.5
Hispanic	1,042.5	23.3	76.7	13.6	17.7

Table 5. Prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by selected population characteristics (NMES Household Data, 1987) *continued*

Population characteristics	Total beneficiaries (in thousands)	Percent beneficiaries without prescribed medicines	Percent beneficiaries with at least one prescribed medicine	Mean prescribed medicines per beneficiary	Mean prescribed medicines per beneficiary with at least one prescribed medicine
Total[a]	31,801.5	18.0	82.0	15.3	18.7
Family Income Related to Poverty Status[b]					
Poor	3,973.8	14.9	85.1	19.0	22.4
Near poor	2,224.2	14.4	85.6	19.4	22.7
Low income	5,675.4	18.0	82.0	16.9	20.6
Middle income	9,860.4	17.7	82.3	14.5	17.6
High income	8,969.7	19.5	80.5	13.2	16.4
Health Insurance Status					
Medicare only	5,992.7	25.8	74.2	13.5	18.2
Medicaid[c]	2,393.6	10.9	89.1	20.9	23.5
Private[c]	23,415.3	16.7	83.3	15.2	18.2
Employment Status					
Employed	3800.0	24.9	75.1	9.9	13.2
Not employed	27,977.5	17.0	83.0	16.0	19.3
Education					
Less than 12 years	14,725.4	17.3	82.7	16.5	20.0
12 years	9,623.6	18.4	81.6	14.5	17.7
13 years or more	6,700.4	16.7	83.3	14.6	17.5
U.S. Census Region					
Northeast	6,973.5	20.0	80.0	15.0	18.7
North Central	7,981.9	20.2	79.8	15.1	18.9
South	11,179.4	16.6	83.4	16.3	19.6
West	5,666.7	15.2	84.8	14.0	16.5

[a]The population total includes persons omitted from the separate categories of population characteristics. They comprise persons with unknown ADL or perceived health status; in families with negative income; persons with unknown education or under 17 years of age; with unknown employment status or under 16 years of age; and all other ethnic/race groups not shown separately.

[b]Where near poor refers to beneficiaries in families with income between the poverty line and 125 percent of the poverty line; low income, between 125 percent and 200 percent of the poverty line; middle income, between 200 and 400 percent of the poverty line; and high income, over 400 percent of the poverty line.

[c]Self-reported coverage in addition to Medicare. The private insurance category contains 42 (unweighted) persons covered by CHAMPUS/CHAMPVA.

Note: The standard error estimates for the statistics in this table are presented in Table H-5 in Appendix H.

SOURCE: National Center for Health Services Research and Health Care Technology Assessment, National Medical Expenditure Survey

Table 6. Number of prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by selected population characteristics (NMES Household Data, 1987)

Population characteristics	Number of prescriptions (in millions)	Mean prescribed medicines per beneficiary	Percent of total beneficiaries				
			Without prescribed medicines	With 1-4 prescribed medicines	With 5-9 prescribed medicines	With 10-20 prescribed medicines	With 21 + prescribed medicines
Total[a]	486.6	15.3	18.0	17.8	14.6	22.4	27.2
Age in Years							
Less than 65	75.1	17.1	22.5	16.5	11.2	20.3	29.6
65 to 69	123.8	13.2	21.6	19.6	15.2	21.1	22.4
70 to 74	115.9	15.5	17.5	17.3	13.7	24.0	27.5
75 to 79	81.4	15.7	14.5	17.2	15.5	23.8	29.0
80 to 84	58.4	17.9	11.6	13.9	16.5	21.9	36.1
85 or older	32.0	14.7	12.6	21.3	17.3	23.9	24.8
Age and Gender							
Male	187.9	13.9	21.3	18.7	14.6	21.4	24.1
Less than 65	38.5	16.9	26.0	15.5	8.7	20.1	29.7
65 to 69	50.4	12.0	22.9	21.2	14.3	21.6	19.9
70 to 74	43.8	13.8	20.7	18.9	14.8	22.2	23.5
75 to 79	28.1	13.5	17.4	20.5	16.0	21.2	24.9
80 to 84	17.9	15.9	18.4	10.1	21.4	19.2	31.0
85 or older	9.2	13.5	15.1	21.5	19.1	24.0	20.3
Female	298.7	16.4	15.5	17.1	14.6	23.2	29.6
Less than 65	36.5	17.4	18.6	17.6	13.8	20.5	29.5
65 to 69	73.4	14.3	20.6	18.3	15.8	20.7	24.5
70 to 74	72.1	16.9	15.1	16.1	12.9	25.4	30.5
75 to 79	53.3	17.2	12.6	14.9	15.1	25.6	31.7
80 to 84	40.6	19.0	8.1	15.9	13.9	23.3	38.8
85 or older	22.8	15.2	11.5	21.2	16.5	23.9	26.9
Difficulties with Activities of Daily Living							
None	390.0	14.0	19.2	18.9	14.8	22.6	24.5
One	39.4	23.8	8.5	9.7	16.1	22.8	42.9
Two or more	52.5	26.2	8.2	10.3	10.8	18.8	51.9
Perceived Health Status							
Excellent	13.7	5.1	39.0	27.8	13.8	14.2	5.1
Good	123.3	9.9	22.8	22.4	17.0	22.5	15.3
Fair	202.5	18.8	10.5	13.3	13.6	26.6	35.9
Poor	126.0	31.1	5.7	7.4	10.2	17.9	58.7
Ethnic/Racial Background							
White	421.4	15.4	17.5	17.7	14.6	22.7	27.5
Black	45.2	15.5	20.3	15.5	14.1	21.6	28.6
Hispanic	14.2	13.6	23.3	23.4	13.6	16.4	23.3

Table 6. Number of prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by selected population characteristics (NMES Household Data, 1987) *continued*

Population characteristics	Number of prescriptions (in millions)	Mean prescribed medicines per beneficiary	Percent of total beneficiaries				
			Without prescribed medicines	With 1-4 prescribed medicines	With 5-9 prescribed medicines	With 10-20 prescribed medicines	With 21 + prescribed medicines
Total[a]	486.6	15.3	18.0	17.8	14.6	22.4	27.2
Family Income Related to Poverty Status[b]							
Poor	75.6	19.0	14.9	13.9	14.2	20.9	36.1
Near poor	43.2	19.4	14.4	12.7	13.8	21.8	37.3
Low income	95.7	16.9	18.0	15.1	14.9	20.6	31.4
Middle income	142.6	14.5	17.7	19.4	14.3	23.7	24.8
High income	118.4	13.2	19.5	20.0	14.6	23.8	22.1
Health Insurance Status							
Medicare only	80.9	13.5	25.8	18.0	13.3	18.8	24.0
Medicaid[c]	50.0	20.9	10.9	12.3	13.4	22.5	40.9
Private[c]	355.7	15.2	16.7	18.3	15.0	23.3	26.7
Employment Status							
Employed	37.6	9.9	24.9	23.3	16.5	19.7	15.6
Not employed	449.0	16.0	17.0	17.0	14.4	22.8	28.9
Education							
Less than 12 years	243.3	16.5	17.3	16.6	14.2	21.6	30.3
12 years	139.2	14.5	18.4	18.2	14.5	24.3	24.6
13 years or more	97.6	14.6	16.7	19.2	15.9	22.4	25.8
U.S. Census Region							
Northeast	104.4	15.0	20.0	17.0	14.6	21.3	27.2
North Central	120.4	15.1	20.2	17.9	14.7	20.5	26.8
South	182.5	16.3	16.6	16.5	14.1	23.3	29.6
West	79.2	14.0	15.2	21.2	15.6	24.8	23.3

[a]The population total includes persons omitted from the separate categories of population characteristics. They comprise persons with unknown ADL or perceived health status; in families with negative income; persons with unknown education or under 17 years of age; with unknown employment status or under 16 years of age; and all other ethnic/race groups not shown separately.

[b]Where near poor refers to beneficiaries in families with income between the poverty line and 125 percent of the poverty line; low income, between 125 percent and 200 percent of the poverty line; middle income, between 200 and 400 percent of the poverty line; and high income, over 400 percent of the poverty line.

[c]Self-reported coverage in addition to Medicare. The private insurance category contains 42 (unweighted) persons covered by CHAMPUS/CHAMPVA.

Note: The standard error estimates for the statistics in this table are presented in Table H-6 in Appendix H.

SOURCE: National Center for Health Services Research and Health Care Technology Assessment, National Medical Expenditure Survey

Table 7. Annual expenditures for prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by selected population characteristics (NMES Household Data, 1987)

Population characteristics	Total prescription expenditure (in millions)	Mean expenditure per beneficiary	Percent distribution of beneficiaries by total annual expenditures[d]						
			$0	$1-$150	$151-$300	$301-$500	$501-$600	$601-$700	$701 or more
Total[a]	$ 8,318.4	$ 261.6	18.3	34.3	17.7	12.6	4.3	3.1	9.7
Age in Years									
Less than 65	1,389.0	317.1	22.7	28.8	15.3	10.2	4.9	4.2	13.8
65 to 69	2,140.1	229.0	21.9	35.5	17.2	10.8	3.8	2.8	7.9
70 to 74	1,967.8	263.8	17.8	33.5	17.6	13.4	4.0	3.4	10.2
75 to 79	1,364.9	263.9	14.9	34.4	20.2	14.3	4.7	2.6	8.8
80 to 84	963.0	295.0	12.0	33.7	17.9	16.9	5.5	3.3	10.8
85 or older	493.6	226.4	12.6	43.2	18.7	12.1	3.2	2.0*	8.0
Age and Gender									
Male	3,354.1	247.2	21.7	34.0	16.6	11.7	3.7	3.0	9.2
Less than 65	737.8	323.0	26.4	25.8	13.7	9.1	5.2	4.5	15.4
65 to 69	896.3	212.8	23.4	35.3	16.6	12.2	3.1	2.9	6.5
70 to 74	779.8	244.9	21.4	35.1	16.1	11.2	2.9	3.6	9.8
75 to 79	479.2	230.7	17.6	36.8	19.9	13.6	3.6	1.8*	6.8
80 to 84	314.7	279.5	18.4	32.2	17.6	12.2	5.3	2.5*	11.7
85 or older	146.3	214.6	15.1	42.8	16.7	14.0	3.0*	1.3*	7.0*
Female	4,964.3	272.2	15.7	34.5	18.5	13.3	4.8	3.2	10.1
Less than 65	651.1	310.6	18.7	32.2	17.2	11.4	4.6	3.8	12.2
65 to 69	1,243.8	242.3	20.6	35.7	17.7	9.7	4.4	2.8	9.1
70 to 74	1,188.0	277.9	15.2	32.3	18.8	15.1	4.8	3.3	10.5
75 to 79	885.7	286.3	13.1	32.9	20.4	14.8	5.5	3.2	10.1
80 to 84	648.4	303.1	8.6	34.4	18.1	19.4	5.6	3.7	10.3
85 or older	347.3	231.7	11.5	43.5	19.7	11.3	3.3	2.4*	8.4
Difficulties with Activities of Daily Living									
None	6,693.0	240.6	19.5	35.3	18.0	12.0	4.0	2.8	8.4
One	653.2	393.4	8.5	30.6	16.5	16.6	6.5	4.3	17.1
Two or more	891.0	444.7	8.2	24.3	15.4	17.6	7.3	5.7	21.4
Perceived Health Status									
Excellent	241.1	89.6	39.6	42.2	10.0	4.7	1.3*	1.1*	1.2*
Good	2,153.4	172.8	23.1	40.6	18.1	9.3	2.9	1.8	4.2
Fair	3,421.7	317.6	10.9	29.5	20.3	17.2	5.8	3.6	12.6
Poor	2,106.8	519.9	5.8	20.4	16.0	18.1	7.6	7.0	25.2
Ethnic/Racial Background									
White	7,291.4	267.3	17.8	34.1	17.8	12.7	4.5	3.2	10.0
Black	694.0	238.2	20.8	34.2	17.0	12.6	3.4	3.3	8.7
Hispanic	245.1	235.1	23.3	35.4	14.0	12.0	3.8*	1.7*	9.8

Table 7. Annual expenditures for prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by selected population characteristics (NMES Household Data, 1987) *continued*

Population characteristics	Total prescription expenditure (in millions)	Mean expenditure per beneficiary	Percent distribution of beneficiaries by total annual expenditures[d]						
			$0	$1-$150	$151-$300	$301-$500	$501-$600	$601-$700	$701 or more
Total[a]	$ 8,318.4	$ 261.6	18.3	34.3	17.7	12.6	4.3	3.1	9.7
Family Income Related to Poverty Status[b]									
Poor	1,189.9	299.4	15.3	29.0	20.1	15.7	3.9	3.7	12.4
Near poor	677.8	304.8	14.7	29.8	19.4	17.3	4.8	2.5*	11.4
Low income	1,574.7	277.5	18.0	34.2	16.2	11.9	5.5	3.6	10.6
Middle income	2,504.9	254.0	18.0	35.4	18.5	12.0	4.4	2.5	9.2
High income	2,198.1	245.1	19.8	35.6	16.8	12.0	3.6	3.4	8.9
Health Insurance Status									
Medicare only	1,273.7	212.5	26.2	35.2	16.4	8.9	3.4	2.6	7.4
Medicaid[c]	811.3	339.0	11.1	30.0	16.7	17.6	6.2	4.2	14.2
Private[c]	6,233.4	266.2	17.0	34.5	18.1	13.1	4.3	3.2	9.8
Employment Status									
Employed	675.3	177.7	25.4	40.7	13.9	9.7	3.0	2.4	5.0
Not employed	7,643.1	273.2	17.2	33.4	18.2	13.0	4.5	3.2	10.4
[illegible]cation									
Less than 12 years	4,014.2	272.6	17.6	33.2	18.0	13.0	4.5	3.2	10.5
12 years	2,388.6	248.2	18.8	34.4	18.0	12.4	4.1	2.8	9.5
13 years or more	1,803.2	269.1	17.0	36.4	17.6	12.2	4.3	3.5	9.0
U.S. Census Region									
Northeast	1,795.9	257.5	20.0	34.9	16.3	12.0	3.7	2.6	10.4
North Central	2,015.2	252.5	20.3	34.2	17.6	11.3	4.4	3.2	9.0
South	3,032.6	271.3	17.0	32.4	18.9	14.0	4.6	3.4	9.8
West	1,474.7	260.2	15.8	37.3	17.1	12.7	4.3	3.1	9.8

[a]The population total includes persons omitted from the separate categories of population characteristics. They comprise persons with unknown ADL or perceived health status; in families with negative income; persons with unknown education or under 17 years of age; with unknown employment status or under 16 years of age; and all other ethnic/race groups not shown separately.

[b]Where near poor refers to beneficiaries in families with income between the poverty line and 125 percent of the poverty line; low income, between 125 percent and 200 percent of the poverty line; middle income, between 200 and 400 percent of the poverty line; and high income, over 400 percent of the poverty line.

[c]Self-reported coverage in addition to Medicare. The private insurance category contains 42 (unweighted) persons covered by CHAMPUS/CHAMPVA.

[d]Includes beneficiaries who obtained medications free of charge.

Note: The standard error estimates for the statistics in this table are presented in Table H-7 in Appendix H.

*Relative standard error is equal to or greater than 30 percent.

SOURCE: National Center for Health Services Research and Health Care Technology Assessment, National Medical Expenditure Survey

Table 8. Prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by therapeutic function and selected population characteristics (Health Household Data, 1987)

Population characteristics	Total prescribed medicines (in millions)	Percent distribution of total prescriptions by therapeutic function classification[d]									
		Cardio-vascular	Central nervous system	Electrolytic, caloric, and water balance	Hormones and synthetic substi-tutes	Gastro-intestinal	Anti-infective	Eye, ear, nose and throat prepara-tions	Autonomic	Smooth muscle relaxants	All others[e]
Total[a]	486.6	29.1	19.3	14.7	8.8	5.5	4.2	3.3	3.5	2.6	8.6
Age in Years											
Less than 65	75.1	23.0	30.9	11.5	7.5	5.3	4.5	1.2	4.2	2.5	9.0
65 to 69	123.8	29.9	17.7	14.6	11.0	4.8	4.8	2.2	3.6	2.6	8.5
70 to 74	115.9	29.1	16.1	13.8	10.2	5.8	4.4	4.0	4.2	3.3	8.8
75 to 79	81.4	29.9	18.1	16.2	7.5	6.0	3.9	4.6	2.9	2.4	8.2
80 to 84	58.4	33.2	18.2	16.3	6.6	5.1	3.2	4.4	2.6	1.6	8.5
85 or older	32.0	30.7	15.7	18.3	5.2	7.0	3.5	4.9	2.6	2.5	9.2
Age and Gender											
Male	187.9	31.6	17.1	13.5	7.5	5.4	4.4	3.6	3.7	3.8	9.2
Less than 65	38.5	28.7	27.8	11.3	4.9	5.9	4.7	1.6*	3.7	3.2	8.0
65 to 69	50.4	35.5	14.6	13.7	8.1	4.2	4.5	2.9	3.4	3.1	9.8
70 to 74	43.8	30.7	13.8	12.4	9.3	5.4	4.8	3.8	4.5	5.3	9.5
75 to 79	28.0	30.9	14.6	15.3	8.1	6.4	4.2	5.0	2.8	3.2	9.2
80 to 84	17.9	31.9	15.8	16.0	7.1	5.3	3.1	5.2*	3.6*	2.6*	9.1
85 or older	9.2	28.8	11.0	15.9	5.6*	6.8	4.0	7.8*	4.6*	6.3	8.6
Female	298.7	27.5	20.8	15.4	9.6	5.6	4.1	3.2	3.4	1.9	8.3
Less than 65	36.5	17.0	34.2	11.8	10.2	4.7	4.4	0.9	4.7	1.8*	10.0
65 to 69	73.4	26.0	19.9	15.3	12.9	5.2	4.9	1.8	3.8	2.3	7.6
70 to 74	72.1	28.2	17.4	14.6	10.7	6.1	4.2	4.1	4.0	2.1	8.3
75 to 79	53.3	29.4	19.9	16.8	7.2	5.8	3.8	4.4	2.9	1.9	7.7
80 to 84	40.6	33.8	19.2	16.4	6.4	5.0	3.2	4.1	2.1	1.2	8.3
85 or older	22.8	31.5	17.6	19.3	5.0	7.1	3.2	3.7	1.8	0.9*	9.4
Difficulties with Activities of Daily Living											
None	390.0	29.9	18.2	14.8	9.1	5.2	4.4	3.5	3.4	2.6	8.6
One	39.4	26.0	24.6	13.9	6.8	6.9	3.8	3.4	4.1	2.6	7.6
Two or more	52.5	25.4	23.3	14.6	7.9	6.6	3.4	2.5	3.7	2.4	10.0

Table 23. Prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by therapeutic function and selected population characteristics (National Household Data, 1987) *continued*

Population characteristics	Total prescribed medicines (in millions)	Percent distribution of total prescriptions by therapeutic function classification[d]									
		Cardio-vascular	Central nervous system	Electrolytic, caloric, and water balance	Hormones and synthetic substi-tutes	Gastro-intestinal	Anti-infective	Eye, ear, nose and throat prepara-tions	Autonomic	Smooth muscle relaxants	All others[e]
Total[a]	486.5	29.1	19.3	14.7	8.8	5.5	4.2	3.3	3.5	2.6	8.6
Perceived Health Status											
Excellent	13.7	29.6	16.2	14.7	9.4	3.3	7.1	7.1	1.4*	0.9*	9.6
Good	123.3	29.0	17.4	16.8	9.8	4.5	5.1	4.2	2.6	1.9	8.4
Fair	202.5	29.7	18.9	14.2	8.5	6.1	4.0	3.3	3.8	2.8	8.4
Poor	126.0	27.2	22.2	13.2	8.6	6.0	3.6	2.3	4.4	3.3	8.9
Ethnic/Racial Background											
White	421.4	29.1	19.5	14.5	8.6	5.6	4.3	3.2	3.6	2.7	8.7
Black	45.2	29.1	17.1	16.4	9.8	5.0	3.1	5.0	3.2	1.9	8.8
Hispanic	14.2	27.0	24.6	12.4	8.3	5.8	5.3	3.2	3.6	2.8*	6.3
Family Income Related to Poverty Status[b]											
Poor	75.6	26.8	22.0	14.5	7.8	5.6	4.3	3.7	4.0	2.4	8.6
Near poor	43.2	27.5	22.6	15.4	7.5	7.1	3.2	3.4	2.2	2.4	8.1
Low income	95.7	28.9	21.3	14.0	8.1	4.9	4.2	3.2	3.8	2.8	8.3
Middle income	142.6	30.9	17.8	14.7	9.8	5.6	4.3	3.1	3.0	2.6	8.1
High income	118.4	29.1	16.9	15.1	9.0	5.2	4.5	3.7	4.2	2.5	9.6
Health Insurance Status											
Medicare only	80.9	26.6	21.7	15.7	7.8	5.8	4.0	2.8	3.6	2.8	8.6
Medicaid[c]	50.0	26.1	23.1	13.5	8.4	7.2	3.5	3.0	3.7	2.5	8.6
Private[c]	355.7	30.1	18.3	14.6	9.0	5.2	4.4	3.5	3.5	2.6	8.6
Employment Status											
Employed	37.6	27.6	16.6	15.0	11.0	5.5	5.9	4.0	3.2	2.2	8.9
Not employed	449.0	29.2	19.6	14.6	8.6	5.5	4.1	3.3	3.6	2.6	8.6

Table 24. Prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by therapeutic function and selected population characteristics (Household Data, 1987) *continued*

Population characteristics	Total prescribed medicines (in millions)	Percent distribution of total prescriptions by therapeutic function classification[d]									
		Cardio-vascular	Central nervous system	Electrolytic, caloric, and water balance	Hormones and synthetic substi-tutes	Gastro-intestinal	Anti-infective	Eye, ear, nose and throat prepara-tions	Autonomic	Smooth muscle relaxants	All others[e]
Total[a]	486.5	29.1	19.3	14.7	8.8	5.5	4.2	3.3	3.5	2.6	8.6
Education											
Less than 12 years	243.3	29.2	19.8	15.0	8.5	5.9	4.0	3.3	3.1	2.5	8.4
12 years	139.2	29.9	18.1	14.8	9.6	5.2	4.2	2.8	4.2	2.8	8.2
13 years or more	97.6	27.5	20.2	13.6	8.4	5.1	4.8	4.2	3.7	2.5	9.9
U.S. Census Region											
Northeast	104.4	32.8	15.6	16.9	7.9	5.1	3.5	4.0	2.7	2.5	8.5
North Central	120.4	28.2	20.1	14.7	7.7	5.9	4.8	3.1	4.0	2.8	8.5
South	182.5	28.9	19.7	13.6	9.4	5.5	4.2	3.3	3.7	2.7	8.6
West	79.2	25.9	22.2	14.0	10.2	5.4	4.4	2.9	3.5	2.3	9.0

[a]The population total includes persons omitted from the separate categories of population characteristics. They comprise persons with unknown ADL or perceived health status; in families with negative income; persons with unknown education or under 17 years of age; with unknown employment status or under 16 years of age; and all other ethnic/race groups not shown separately.

[b]Where near poor refers to beneficiaries in families with income between the poverty line and 125 percent of the poverty threshold; low income, between 125 percent and 200 percent of the poverty line; middle income, between 200 and 400 percent of the poverty line; and high income, over 400 percent of the poverty line.

[c]Self-reported coverage in addition to Medicare. The private insurance category contains 42 (unweighted) persons covered by CHAMPUS/CHAMPVA.

[d]Pharmacologic-therapeutic classification data from the American Hospital Formulary Service, 1988. Used with permission of the American Society of Hospital Pharmacists.

[e]Includes the following: Antihistamines; antineoplastic agents; blood formation and coagulation; diagnostic agents; disinfectants; enzymes; antitussives, expectorants and mucyolytic agents; gold compounds; heavy metal antagonists; local anesthetics; serums, toxoids, and vaccines; skin and mucous membrane agents; vitamins; and other or unclassified prescribed medicines.

Note: The standard error estimates for the statistics in this table are presented in Table H-8 in Appendix H.

*Relative standard error is equal to or greater than 30 percent.

SOURCE: National Center for Health Services Research and Health Care Technology Assessment, National Medical Expenditure Survey

Table 9. Prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by major ICD-9 categories and selected population characteristics (NMES Household Data, 1987)

Population characteristics	Percent distribution of total prescriptions by ICD-9 categories[d]							
	Diseases of circulatory system	Endocrine disorders	Musculoskeletal disorders	Diseases of respiratory system	Diseases of nervous system	Diseases of digestive system	Diseases of genito-urinary system	Others[e]
Total[a]	38.9	10.2	7.9	7.5	5.5	3.9	1.8	17.2
Age in Years								
Less than 65	29.8	7.8	7.8	6.1	5.6	3.8	1.6	24.4
65 to 69	40.4	13.3	7.8	8.9	4.0	3.6	2.1	14.9
70 to 74	39.0	11.8	7.1	9.3	5.6	4.6	1.9	15.6
75 to 79	40.7	8.3	8.9	6.9	6.3	4.0	1.8	16.6
80 to 84	43.5	7.7	8.4	4.5	6.1	3.4	1.4	17.6
85 or older	40.7	7.0	8.2	5.8	7.1	4.0	2.2	15.8
Age and Gender								
Male	41.1	8.9	6.0	8.6	5.9	3.5	1.8	16.7
Less than 65	32.9	6.1	6.5	4.8	6.3*	3.9	0.9*	24.9
65 to 69	45.8	10.2	6.1	9.1	4.8	2.9	1.8	13.5
70 to 74	42.0	12.0	5.0	12.5	5.4	3.9	1.8	12.8
75 to 79	44.0	7.4	6.6	8.6	5.7	3.3	2.7	16.7
80 to 84	40.9	7.4	7.0	5.0*	6.7	3.9	2.0	19.9
85 or older	37.1	6.9*	3.8	11.1	11.5	3.7*	4.0*	11.6
Female	37.4	10.9	9.1	6.8	5.2	4.2	1.8	17.6
Less than 65	26.6	9.6	9.2	7.5	4.8	3.6	2.3	23.8
65 to 69	36.6	15.4	8.9	8.7	3.5	4.1	2.3	15.9
70 to 74	37.1	11.7	8.4	7.4	5.8	5.0	2.0	17.4
75 to 79	39.0	8.8	10.0	6.0	6.6	4.4	1.4	16.6
80 to 84	44.6	7.8	9.0	4.3	5.8	3.1	1.2	16.7
85 or older	42.2	7.0	10.1	3.7	5.3	4.1	1.4	17.5
Difficulties with Activities of Daily Living								
None	40.0	10.6	7.3	7.9	5.1	3.9	2.0	16.8
One	33.7	7.2	9.5	7.2	6.0	5.4	0.9	19.2
Two or more	34.3	9.4	11.1	4.9	7.7	3.2	1.6	18.5
Perceived Health Status								
Excellent	43.0	10.0	6.7	5.7	8.2	2.9	4.8	14.2
Good	39.9	11.1	8.0	6.1	5.6	3.9	1.9	18.5
Fair	39.5	10.4	8.0	7.8	5.0	4.4	1.8	17.0
Poor	35.6	9.6	7.8	9.1	5.9	3.4	1.6	17.2
Ethnic/Racial Background								
White	39.0	9.8	7.8	7.8	5.6	4.0	1.8	17.6
Black	37.8	12.5	8.8	4.6	5.4	3.0	1.6	15.5
Hispanic	37.4	9.4	8.9	6.8	4.1*	4.8	3.1*	14.4

Table 9. Prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by major ICD-9 categories and selected population characteristics (NMES Household Data, 1987) *continued*

Population characteristics	Percent distribution of total prescriptions by ICD-9 categories[d]							
	Diseases of circulatory system	Endocrine disorders	Musculoskeletal disorders	Diseases of respiratory system	Diseases of nervous system	Diseases of digestive system	Diseases of genitourinary system	Others[e]
Total[a]	38.9	10.2	7.9	7.5	5.5	3.9	1.8	17.2
Family Income Related to Poverty Status[b]								
Poor	35.1	9.9	9.9	6.7	5.1	3.2	1.5	19.9
Near poor	38.6	9.6	7.3	6.1	4.3	4.8	1.5	20.8
Low income	39.9	9.4	8.2	7.3	5.2	3.8	1.4	18.5
Middle income	41.2	11.2	7.4	7.4	5.9	3.8	2.3	14.4
High income	38.4	10.0	7.5	9.0	6.2	4.4	2.0	15.6
Health Insurance Status								
Medicare only	38.2	8.9	7.7	6.5	4.9	4.1	1.1	20.8
Medicaid[c]	33.7	10.5	9.7	5.6	5.2	4.0	1.7	19.2
Private[c]	39.8	10.4	7.7	8.0	5.6	3.9	2.0	16.1
Employment Status								
Employed	38.6	11.4	7.6	9.6	5.0	3.3	3.2	15.9
Not employed	38.9	10.1	7.9	7.3	5.5	4.0	1.7	17.3
Education								
Less than 12 years	38.2	10.8	8.1	7.1	5.2	4.0	1.8	17.7
12 years	40.7	10.1	7.4	7.8	4.5	3.6	2.0	16.6
13 years or more	37.6	8.9	8.3	8.2	7.5	4.3	1.9	17.3
U.S. Census Region								
Northeast	44.4	10.2	6.4	6.3	5.8	3.6	1.2	16.0
North Central	39.2	8.9	8.9	8.3	5.2	3.7	1.9	17.5
South	37.8	10.5	7.5	8.0	5.2	4.3	2.1	16.5
West	33.3	11.4	9.2	6.6	6.2	3.8	2.1	20.2

[a]The population total includes persons omitted from the separate categories of population characteristics. They comprise persons with unknown ADL or perceived health status; in families with negative income; persons with unknown education or under 17 years of age; with unknown employment status or under 16 years of age; and all other ethnic/race groups not shown separately.

[b]Where near poor refers to beneficiaries in families with income between the poverty line and 125 percent of the poverty line; low income, between 125 percent and 200 percent of the poverty line; middle income, between 200 and 400 percent of the poverty line; and high income, over 400 percent of the poverty line.

[c]Self-reported coverage in addition to Medicare. The private insurance category contains 42 (unweighted) persons covered by CHAMPUS/CHAMPVA.

[d]See Appendix C for the condition coding for prescribed medicines. Only the first condition reported by household respondents as associated with the prescription is used.

[e]Includes diseases of the blood, congenital anomalies; impairment; infectious diseases; injury and poisoning; mental disorders; neoplasms; procedures, diseases of the skin; and symptoms, signs ill-defined.

Note: The standard error estimates for the statistics in this table are presented in Table H-9 in Appendix H.

*Relative standard error is equal to or greater than 30 percent.

SOURCE: National Center for Health Services Research and Health Care Technology Assessment, National Medical Expenditure Survey

Table 10. Prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by generic or brand name classification and selected population characteristics (NMES Household Data, 1987)

Population characteristics	Number of prescriptions[d] (in millions)	Percent by generic name	Percent by brand name
Total[a]	486.6	24.9	73.0
Age in Years			
Less than 65	75.1	26.9	70.4
65 to 69	123.8	25.1	72.9
70 to 74	115.9	25.7	72.6
75 to 79	81.4	23.9	74.1
80 to 84	58.4	21.7	76.0
85 or older	32.0	24.9	72.3
Age and Gender			
Male	187.9	27.0	71.0
Less than 65	38.5	29.3	68.8
65 to 69	50.4	28.0	70.0
70 to 74	43.8	26.4	71.6
75 to 79	28.1	26.2	71.8
80 to 84	17.9	23.3	74.6
85 or older	9.2	23.5	73.8
Female	298.7	23.6	74.2
Less than 65	36.5	24.4	72.1
65 to 69	73.4	23.1	75.0
70 to 74	72.1	25.2	73.2
75 to 79	53.3	22.7	75.4
80 to 84	40.6	21.0	76.7
85 or older	22.8	25.5	71.7
Difficulties with Activities of Daily Living			
None	390.0	24.9	73.0
One	39.4	24.3	73.5
Two or more	52.5	25.6	72.4
Perceived Health Status			
Excellent	13.7	27.7	69.7
Good	123.3	23.7	74.1
Fair	202.5	23.9	74.1
Poor	126.0	27.4	70.8
Ethnic/Racial Background			
White	421.4	24.3	73.6
Black	45.2	29.3	68.2
Hispanic	14.2	22.6	74.5

Table 10. Prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by generic or brand name classification and selected population characteristics (NMES Household Data, 1987) *continued*

Population characteristics	Number of prescriptions[d] (in millions)	Percent by generic name	Percent by brand name
Total[a]	486.6	24.9	73.0
Family Income Related to Poverty Status[b]			
Poor	75.6	27.0	71.2
Near poor	43.2	27.6	70.1
Low income	95.7	25.0	73.0
Middle income	142.6	24.2	73.9
High income	118.4	23.3	74.4
Health Insurance Status			
Medicare only	80.9	28.8	68.6
Medicaid[c]	50.0	29.8	67.9
Private[c]	355.7	23.3	74.7
Employment Status			
Employed	37.6	25.0	72.2
Not employed	449.0	24.9	73.1
Education			
Less than 12 years	243.3	25.7	72.1
12 years	139.2	25.1	72.9
13 years or more	97.6	22.5	75.6
U.S. Census Region			
Northeast	104.4	24.7	73.4
North Central	120.4	23.4	74.3
South	182.5	24.1	73.7
West	79.2	29.3	68.8

[a]The population total includes persons omitted from the separate categories of population characteristics. They comprise persons with unknown ADL or perceived health status; in families with negative income; persons with unknown education or under 17 years of age; with unknown employment status or under 16 years of age; and all other ethnic/race groups not shown separately.

[b]Where near poor refers to beneficiaries in families with income between the poverty line and 125 percent of the poverty threshold; low income, between 125 percent and 200 percent of the poverty line; middle income, between 200 and 400 percent of the poverty line; and high income, over 400 percent of the poverty line.

[c]Self-reported coverage in addition to Medicare. The private insurance category contains 42 (unweighted) persons covered by CHAMPUS/CHAMPVA.

[d]Includes 1,228 prescriptions with missing or undetermined generic or brand name.

Note: The standard error estimates for the statistics in this table are presented in Table H-10 in Appendix H.

*Relative standard error is equal to or greater than 30 percent.

SOURCE: National Center for Health Services Research and Health Care Technology Assessment, National Medical Expenditure Survey

3. THE IMPACT OF INSURANCE ON PRESCRIPTION UTILIZATION AND EXPENDITURE

In passing the benefits for prescribed medicines in the Medicare Catastrophic Coverage Act, there was concern that the introduction of some level of coverage for outpatient prescriptions would "induce" additional utilization and increase the cost of the program. A study of this issue was to be included in the report by NCHSR on prescription expenses incurred by Medicare beneficiaries. The NMES data that are needed for this study of induced demand are currently being collected as part of the NMES Health Insurance Plans Survey (HIPS) and will not become available for analysis until some time in 1990. These new data will identify individuals with and without coverage of prescribed medicines in 1987. For those with such coverage, detailed information will be available on the cost sharing provisions of the plans such as copayments and coinsurance rates for those with first dollar coverage and deductible amounts and coinsurance rates for those on deductible plans.

Although the new data are not yet available from NMES for the current report, data from the National Medical Care Expenditure Survey (NMCES) conducted in 1977 have been used to provide preliminary estimates of the potential impact of health insurance coverage on the use of prescribed medicines. The rationale for using the NMCES data was that the effect of insurance coverage on the use of prescribed medicines would be relatively stable over time. When the data from the HIPS component of NMES are available, this analysis will be updated to determine if use of prescription drugs under different deductible and coinsurance arrangements has changed between 1977 and 1987. The analysis of induced demand using the 1977 data is discussed in section 3.2.

The primary concern in this chapter is the extent to which Medicare beneficiaries may increase their use of prescriptions once the program pays part of the cost. At the outset, it is important to note that the level of potential induced demand cannot be estimated precisely from existing studies. In the absence of definitive studies, a conservative approach to this problem is to establish what the increase in use and costs would be if either all costs are removed (that is, the patient would face no deductible or coinsurance) or the cost to the patient was minimal (no greater than $2 per prescription). The analysis in Section 3.3 is designed to place an upper bound on induced demand by examining such a "worst case" scenario using data from another source on

the use of prescription drugs by elderly individuals with first dollar coverage for prescription drugs in the year 1987.

3.1 Summary of Findings

Studies now in the literature on induced demand with respect to prescription drugs do not resolve the issue of the influence of prescription insurance on prescription use. These studies frequently base the results on populations who obtain coverage because they are, or expect to be, high volume users of prescription drugs. Therefore, analyses of use by such groups often associate prescription drug insurance coverage with atypical high use. In addition, many studies do not take into account the consequences of providing insurance for physician care as an important factor in obtaining prescription drugs.

To explore the issue of induced demand using the data from 1977, sample persons from that data set were grouped according to their type of insurance coverage. The analyses examine two important questions: (1) whether adding insurance coverage for prescription drugs to existing physician benefits affects use and expenditures, and (2) whether the generosity of such coverage makes a difference in use and expenditures for prescription drugs. The results of these analyses suggest there are no significant differences in prescription use or expenditures between insured persons with prescription drug coverage and those without such coverage. Nonelderly persons without any health insurance coverage (there is no comparable group among the elderly because of Medicare) seemed to have somewhat lower use and expenditures for prescription drugs than the nonelderly with insurance. However, the differences were not statistically significant. Finally, the use and expenditures for prescription drugs did not increase as the generosity of the prescription coverage in insurance plans increased.

Under the Medicare Catastrophic Coverage Act of 1988, beneficiaries will have prescription drug coverage with both a deductible and coinsurance payment. The opposite extreme would be a plan that has first dollar coverage with neither a deductible or coinsurance. If there is any induced demand, this latter coverage would be expected to result in the maximum increase in use and expenditures for prescription drugs. To examine this extreme case, data provided by Medco Containment Services, Inc. were analyzed. These data contain information for the year 1987 on elderly individuals with first dollar prescription insurance coverage and

copayments ranging from zero to $2 per prescription. In the analysis, the Medco utilization rates for the elderly Medco population were applied to the NMES noninstitutionalized Medicare population. The resulting annual prescription utilization for noninstitutionalized beneficiaries was 30 percent higher than the NMES estimate of 486.6 million prescriptions. These findings suggest that the upper bound for induced demand when patients have first dollar coverage is 30 percent. It is important to note that the Medco population with this coverage was not representative of elderly Medicare beneficiaries; according to Medco, the group used in this analysis tended to be atypically high users of prescription drugs compared to other elderly individuals with similar first dollar coverage.

3.2 The Impact of Insurance Coverage on Prescription Use and Expenditures Using NMCES Data

3.2.1 Background

There is a great deal of uncertainty regarding the cost of adding insurance coverage of prescribed medicines to Medicare because of the potential for encouraging more prescription use and expenditures. Beginning in 1991, Medicare beneficiaries will have an incentive to increase their use of prescriptions because of the 50 percent coinsurance rate (the percent paid out of pocket by the Medicare beneficiary) if the annual deductible of $600 is exceeded. The incentive for increased use by 1993 is even greater, because the coinsurance rate to beneficiaries who exceed the deductible declines to 20 percent.

In a previous study of the effect of insurance coverage on the use of prescription medicines in the Rand Health Insurance Experiment (HIE), Leibowitz, Manning, and Newhouse (1985) found evidence that more generous insurance coverage of prescriptions is related to higher prescription use and expenditure by persons under 65 years of age. The authors found that prescription expenditures per person in the HIE were about 60 percent higher for individuals on a "free plan" (full coverage) compared to persons randomly assigned to plans with practically no coverage. Similarly, Reeder and Nelson (1985) discovered a decline in prescription use accompanying the introduction of a small (50 cents) copayment for prescriptions in the South Carolina Medicaid program. Knapp (1971) provided a review of studies using self-selected populations which indicated a negative relationship between price and utilization of prescription

drugs. Lingle, Kirk, and Kelly (1987) examined the impact of the New Jersey Pharmaceutical Assistance for Aged (PAA) Program on the health care services used by the elderly. They found that New Jersey Medicare recipients used less inpatient hospital care than a comparable group of Medicare recipients in Pennsylvania who did not have a PAA program covering outpatient prescription expenses. The authors noted that Medicare does pay the drug therapy costs of hospitalized patients and concluded that despite the introduction of coverage for outpatient prescription expenses in the PAA program, the program did not increase the overall health care costs of the elderly. The implication of their finding is that whatever additional use of outpatient prescription drugs was induced by the PAA program was offset by the reduction in Medicare costs for inpatient drug therapy and hospital care.

There are problems with using the findings described above to infer the effect of prescription drug coverage under the Medicare Catastrophic Coverage Act on prescription use. In most of these studies, the subjects were not randomly assigned their insurance coverage, so those with a greater underlying need for prescribed medicines may have selected plans with more generous benefits. Consequently, the positive relationship between use and the comprehensiveness of insurance in these studies overstates the effect of insurance on use, because individuals may choose their insurance coverage on the basis of their actual or expected prescription use. The Rand HIE data are not subject to this self-selecting problem because persons were randomly assigned to different insurance plans in the experiment.

However, there are other limitations in using the Rand results to forecast the effect of the new Medicare benefit. First, the experiment excluded elderly persons. Second, all medical services were covered by the same insurance provisions. Because prescribed medicines are used as "complements" with physician services, and because both are subsidized at the same rate in the Rand experiment, the HIE-based results are unable to distinguish whether the induced demand emanates from subsidizing the price of prescriptions or subsidizing the price of the physician's services. In the Medicare legislation, coverage of prescription drugs is independent of coverage of other medical services.

The data chosen for this analysis are from the 1977 Health Insurance/Employer Survey (HIES) of NMCES and are documented in Cantor (1987) and Cohen and Farley (1984). Although these are survey data and, therefore, the subjects selected their insurance instead of

having it randomly assigned,[7] the HIES data have the advantage of including individuals with similar health insurance coverage for other services but different coverage of prescribed medicines. For those with coverage of prescription expenses, data were also collected on the amount of coverage. Using these data, the objectives of the analysis were as follows:

1. To estimate the effect of outpatient prescription medicine insurance coverage on prescription use and expenditures, for persons with otherwise similar insurance and similar use of physician services.

2. To determine whether the generosity of prescription medicine coverage further affects prescription use and expenditures.

3.2.2 Methodology

For the analysis presented here, only persons uninsured throughout 1977 or privately insured for the entire year were included in the sample. Individuals with Medicare only were excluded, as were persons with Medicaid, CHAMPUS/CHAMPVA, or HMO coverage in any round of the survey to avoid confounding the estimates of private insurance with the effects of coverage of prescription drugs from these sources. The only persons included in the sample with any coverage in addition to private insurance were those with Medicare. The sample was limited to persons 18 years or older.

The sample of privately insured persons was divided into six groups based on general type of health insurance plan (basic only, major medical only, or both basic and major medical) and age (18 to 64 years, and 65 years and older). Each of these plans was further classified as including coverage of prescription medicines or not.[8] Persons with major medical coverage are typically on deductible plans, while those with basic coverage typically have no deductible. Separate models were estimated with each of the three samples of nonelderly persons with different health insurance coverage and persons with no insurance at all, comparing those with and without drug coverage to each other and to the uninsured. The elderly sample with only major

[7]Among the nonelderly, most insurance is purchased through employers, and in 1977 fewer than 20 percent of employees were offered a choice of plans. Consequently, especially among the nonelderly, the amount of self-selection in the NMCES data may not be large.

[8]Further exclusions from the HIES sample were persons who (1) had basic coverage for prescription drugs but no basic health insurance coverage, and (2) who had major medical coverage for prescription drugs but no major medical health insurance coverage.

medical coverage and the sample of elderly persons without any health insurance during the year were too small to analyze. As a result elderly persons with basic plans with and without prescription drug coverage were compared to each other, as were elderly persons with basic and major medical insurance with and without prescription coverage.

To the extent that the sample sizes would allow, persons with major medical coverage of prescription drugs were assigned to one of three groups based on the size of the deductible ($1-50, $51-100, and over $100).[9] Persons with only basic coverage of prescription drugs were assigned to either "high" first-dollar coverage (copayment $3 or less, or insured pays 10 percent or less) or "low" first dollar coverage (insured pays more than 10 percent).[10]

The dependent variables included:

- The probability of obtaining a prescription in 1977.
- The number of prescriptions purchased in 1977, for persons with at least one prescription.
- Annual prescription drug expenditures, for persons with prescription expenses.
- The average charge per prescription, for prescriptions with charges.

A 1977 county-level price index for medical services was used to adjust prescription expenditures for local price differences.[11] Insurance coverage for prescription medicines was specified in two ways. One model only distinguished insured persons as having prescription drug coverage or not. In the second specification, variables indicating the generosity of prescription drug coverage were introduced.

---

[9] A $600 deductible in 1991 has an estimated value in 1977 of approximately $180 after removing the effects of inflation. This estimate is based on the CPI for prescription drugs of 57.2 in 1977 and an estimated value for this index in 1991 of 189.88 which incorporates recent rates of inflation.

[10] Mueller and Monheit (1988) adopted a similar specification for generosity of insurance coverage in their study of the demand for dental care using the 1977 HIES data, as did Cartwright, Hu, and Huang (1988) in their study using HIES data of the impact of alternative Medigap coverage on total charges for hospital stays and physician visits.

[11] Models for the last three dependent variables were estimated in the natural logarithms of the variables. Model estimates reported in the next section were based on these equations but were converted to nonlog values (as were the standard errors reported in Appendix H).

Each model was estimated twice, once with controls for factors other than insurance that might affect use and expenditures for prescription medicines and once without these controls. The control variables include age, gender, race/ethnicity, family income related to poverty status, self-perceived health status, region, years of school completed, marital status, number of days during the year with illness or injury, duration in months of activity limitation during and before the survey year, and number of outpatient physician contacts including telephone calls with or without charges. With the inclusion of the latter variable, the estimates can be viewed as measuring the effect of insurance on the number of prescriptions per physician contact, consistent with the fact that prescriptions must (by their very nature) be obtained initially through a physician. The Medicare benefit for prescription medicines is being added to the existing physician coverage of beneficiaries. To reduce the indirect effect of physician insurance on the use of prescription medicines, the number of physician contacts is included in the model. Indeed, the physician contact variable was the most important in each of the models estimated.[12]

The insurance effects in all of the models were tested (Hausman, 1978) for the self-selection bias discussed above. Only in one group, the nonelderly with basic and major medical insurance, was there any evidence that self-selection had a significant effect on the insurance estimates and this was only with respect to one of the measures (the probability of purchasing a prescription). Furthermore, although the effect of the bias typically makes the estimated relationship between insurance and use even more positive and significant, the estimates produced by the models (as discussed in the next section) are generally not significant and are not even positive in every instance.

3.2.3 Findings

The proportion of individuals with at least one prescription, the number of prescriptions per user, the expenditure per user, and the cost per prescription were predicted with the model estimates for persons in each insurance group in order to facilitate interpretation of the models (Tables 11-15). When derived from the model estimates where control variables were introduced, these values predict utilization and expenditures for populations that are identical

[12]Models estimated without the physician contact variable still supported the study's principal finding of no influence of prescription drug insurance on prescription use and expenditure.

along every dimension represented by the control variables, and differ only in terms of their insurance. The "standardized" population in each instance was defined by the mean values of the control variables for the sample included in the particular model. The estimates without controls indicate the effects of insurance across the actual populations with each type of insurance, where the make-up of those groups varied in terms of demographic characteristics and contacts with physicians. The range of statistical uncertainty around some of these estimates is relatively large; those with standard errors between 30 and 50 percent of the estimate are identified by an asterisk, and those with standard errors equal to or greater than 50 percent of the estimate are not reported.

There were no significant differences in prescription drug use or expenditure between insured persons who had prescription drug coverage and those who did not.[13] Furthermore, among persons with coverage of prescribed medicines, there were no statistically significant effects of the generosity of drug plans on prescription use and expenditures. The uninsured had lower average prescription use and expenditures than nonelderly persons with private health insurance coverage, but only in one instance was the difference statistically significant. Namely, without controlling for other variables, a significantly lower proportion of the nonelderly uninsured (Table 11) obtained a prescription (44.1 percent) compared to persons with basic coverage (about 65 percent). When controls (including the number of physician contacts) were introduced in the model, the probability of obtaining a prescription was similar for the uninsured and those with basic coverage (61.5 percent compared to 67.6 or 69.3 percent), and the differences were not statistically significant. One interpretation of this finding is that the lower use of prescription medicines among the uninsured was the result of their lower use of physician services.

In sum, the NMCES data provide little indication that the addition of prescription coverage to other medical insurance induces substantially higher utilization or expenditures for prescription medicines.

---

[13]Note that the comparisons of the mean number of prescriptions and mean expenditures are only for persons with some utilization during the year, as predicted in the first column of the tables. The average use or expenditure per person (rather than per user) is a function of both the average use or expenditure per user and the average proportion of the population that is users.

3.3 Utilization Under First Dollar Coverage

The previous section addressed the question of induced demand using the 1977 NMCES data. This section employs a different approach. The analysis presented here attempts to provide the upper limit of induced demand under conditions far more generous than those adopted for the Medicare program. In this case, per capita utilization of prescription drugs by individuals 65 years or older with no deductible at all, "first dollar coverage," is used to assess the potential upper limit of induced demand.

To estimate how much additional prescription use and expenditures there might be with first dollar coverage, the rates of use observed in a secondary data source were applied to the noninstitutionalized Medicare population by age and gender. The NMES sample is composed of persons with a nationally representative mixture of prescription drug insurance coverage in 1987 which is, therefore, less generous on average than having no deductible at all. This approach assumes the characteristics affecting the demand for prescription drugs (other than age and gender) for the NMES population are the same as those of the elderly persons in the secondary data source. This analysis did not control for any other patient characteristics in making this projection. The resulting estimate of induced demand is further biased upward because individuals included in the secondary data are known to be high users of prescription drugs.

3.3.1 Data Source

The data used in this analysis were provided by Medco Containment Services, Inc. The following description of Medco and the technical discussion concerning the nature of the Medco data are based on the report prepared by Terry Latanich and Evan Marks of Medco. The report is reproduced in Appendix J.

Medco administers prescription drug benefits via plastic card programs through its subsidiary, PAID Prescriptions, Inc. In addition, through its mail service pharmacy subsidiaries ("National Pharmacies"), Medco operates eight mail service pharmacies which provide maintenance medications to individuals covered by Medco's programs. In 1988, PAID processed approximately 35 million claims, and 14 million prescriptions were dispensed through National Pharmacies. The data presented here are for individuals with "integrated" prescription benefits,

i.e., patients may obtain their prescriptions from either retail pharmacies or from the mail service pharmacies.

Data for approximately 124,000 active and retired eligibles age 65 and older were used in preparing these estimates. Both white and blue collar workers are included who were eligible for the entire calendar year 1987. According to Medco, the Medco group used for the comparative analysis as a whole exhibits a higher utilization rate for prescriptions than other Medco clients with similar characteristics and prescription coverage.

The Medco plans cover the following types of prescriptions: all Federal legend drugs, all state restricted drugs, compounded medications, insulin, and gamma globulin. Excluded are all vitamin preparations, all contraceptive devices or oral contraceptives (regardless of reason for prescription), all immunization agents, non-Federal legend drugs, experimental drugs, medications taken while the individual is a patient in a hospital, rest home, nursing home or similar institution, or medications covered by Worker's Compensation or state occupational disease laws. The per prescription copayment for the individuals included in the Medco data ranged from zero to $2.00.

One adjustment was made in the Medco data to make its utilization comparable to NMES estimates of per person utilization. Mail service prescriptions supplied by National Pharmacies are larger in volume because they average 3.75 times more days supplied per prescription (a rate similar to other mail order prescription services) than prescriptions obtained from retail pharmacies. Therefore, the number of mail service prescriptions in this data set was multiplied by 3.75 to make it consistent with the PAID Prescriptions and NMES data.[14]

3.3.2 Comparative Utilization Rates

The estimates of mean annual utilization rates of prescription drugs based on NMES and Medco data show differences in use between the two samples by age and gender. The smallest difference is among females 70 to 74 years (15 percent); the largest is among males 85 and older (52 percent). As expected, the rates for the Medco individuals with first dollar coverage are

[14]The NMES data also include an unknown number of prescriptions purchased by mail.

consistently higher than the rates reflected in the NMES data. The differences for males are consistently higher than for females (Table 16).

Table 17 applies the rates presented in Table 16 to the population of elderly beneficiaries according to age and gender based on the distribution in the NMES data. The data reported in the NMES and Medco columns reflect the total annual utilization under the respective assumptions of use per person from each data set. For example, based on the NMES utilization rate, there were 50.5 million prescriptions obtained by the 4.2 million male noninstitutionalized beneficiaries 65-69 years of age. The average number of prescriptions obtained by this group was 12.0. Based on the Medco utilization rate, the average number of prescriptions obtained by males 65 to 69 was 17.0. At this rate of use, 71.6 million prescriptions would be obtained by noninstitutionalized male Medicare beneficiaries in the same age group.

Based on the NMES per person utilization rates, the total annual utilization for all elderly Medicare beneficiaries is 411.7 million prescriptions.[15] Using the Medco per person utilization rates, the total would be 535.8 million prescriptions. The difference in these two estimates, roughly 30 percent, represents an upper-limit estimate of the additional demand that may result from first dollar insurance coverage for prescriptions. Based on the assumption that the same 30 percent induced demand would be found with Medicare beneficiaries less than 65 years and that a first dollar program would not affect charges per prescription, the expected total expenditures by the Medicare population for prescriptions would be $10.8 billion.

The Medco data indicate that 19 percent of individuals aged 65 years and older exceeded expenditures of $600 in 1987; almost 25 percent exceeded expenditures of $500. These figures are based on cumulative claims analysis of eligibles presented in Table 4, Appendix J. A comparable estimate from the NMES data in Table 4 of the text shows that 15.9 percent of Medicare beneficiaries age 65 and older had prescription expenditures in excess of $500 in 1987.

Based on information provided by Medco, the prescription utilization rates from their data are biased upwards; that is, the population used to derive the Medco rates consists of atypical

---

[15]The NMES estimate of 411.7 million prescriptions for elderly Medicare beneficiaries differs from the estimate of 427.3 million reported in Table 1 due to the inclusion of utilization by 64 year olds (who turn 65 during 1987) in the 427.3 million estimate.

users of prescription drugs and is not representative of the noninstitutionalized Medicare population. Even more important, the Medicare Catastrophic Coverage Act of 1988 does not provide a first dollar benefit or a copayment schedule similar to Medco; in 1991 the Medicare program has a $600 deductible and an initial 50 percent coinsurance rate.

The estimate of a 30 percent rate of induced demand in this section is not comparable to the estimates of the impact of insurance coverage on utilization of prescribed medicines developed in Section 3.2. In the previous section, statistical controls were introduced for both observed and unobserved differences between individuals with and without prescription insurance that could otherwise confound estimates of induced demand. The 30 percent estimate in this section is instead produced by extrapolating prescription utilization behavior of an atypically high utilization group of elderly individuals with first dollar prescription coverage to the elderly NMES population without introducing proper controls for potential confounding differences between the two groups (other than age and gender). Although the Medco-based estimate of induced demand is biased-upward to some unknown degree because of adverse selection, it is nevertheless of value in setting the upper boundary for induced demand under a hypothetical worst case, a Medicare prescription drug program with no deductible at all.

Table 11. Mean annual expenditures for prescribed medicines and prescriptions obtained by persons 18 to 64 years of age: Estimated impact of basic health insurance coverage (NMCES HIES Data, 1977)

Health insurance coverage[a]	Probability of obtaining a prescription	Number of prescriptions for persons with at least one prescription	Expenditures per person with prescription expenditures	Charge per prescription for prescriptions with charges
		Estimates without controls[b]		
No Insurance	.441[c]	4.45	25.30	5.47
Basic Coverage				
No prescription coverage	.652	5.39	31.12	5.61
Prescription coverage	.660	4.72*	**	5.09
		Estimates with controls[b]		
No Insurance	.615	4.41	25.42	5.62
Basic Coverage				
No prescription coverage	.693	4.85	27.32	5.52
Prescription coverage	.676	4.03*	**	4.97

[a]There were 4,379 persons aged 18-64 years in the sample without health insurance or with basic coverage only. Using weighted data, approximately 46 percent of these had no health insurance during the entire year, 44 percent had basic insurance only for the entire year without any coverage for prescribed medicines, and approximately 10 percent had basic insurance only and coverage of prescribed medicines for the entire year.

[b]Controls include age, gender, race/ethnicity, family income related to poverty status, self-perceived health status, region, years of school completed, marital status, number of days during year with illness or injury, duration in months of activity limitation during and before survey year, and number of outpatient physician contacts including telephone calls with or without charges.

[c]Indicates statistical significance of the estimate relative to the estimate for persons with basic health insurance coverage but without any coverage of prescribed medicines at the 0.05 level.

*Relative standard error is equal to or greater than 30 percent and less than 50 percent.

**Relative standard error is equal to or greater than 50 percent, and the estimate is not reported.

Note: Standard error estimates incorporating sample design effects are given in Table H-11 in Appendix H. Estimates are made using mean values of the population.

SOURCE: National Center for Health Services Research and Health Care Technology Assessment, National Medical Care Expenditure Survey, Health Insurance/Employer Survey Data, 1977

Table 12. Mean annual expenditures for prescribed medicines and prescriptions obtained by persons 65 years of age and older: Estimated impact of basic health insurance coverage (NMCES HIES Data, 1977)

Health insurance coverage[a]	Probability of obtaining a prescription	Number of prescriptions for persons with at least one prescription	Expenditures per person with prescription expenditures	Charge per prescription for prescriptions with charges
Estimates without controls				
Basic Coverage				
No prescription coverage	.798	11.04	69.85	6.25
Prescription coverage	.806*	11.21	74.79	6.38
Estimates with controls[b]				
Basic Coverage				
No prescription coverage	.952	10.60	66.53	6.25
Prescription coverage	.943*	10.74	70.73	6.33

[a]There were 884 persons aged 65 or older in the sample with basic coverage only. Using weighted data, approximately 83 percent of these had basic coverage only for the entire year without any coverage of prescribed medicines, and approximately 17 percent had basic coverage only and coverage of prescribed medicines for the entire year. The sample of elderly persons without any health insurance for the entire year was too small for estimation.

[b]Controls include age, gender, race/ethnicity, family income related to poverty status, self-perceived health status, region, years of school completed, marital status, number of days during year with illness or injury, duration in months of activity limitation during and before survey year, and number of outpatient physician contacts including telephone calls with or without charges.

*Relative standard error is equal to or greater than 30 percent and less than 50 percent.

Note: Standard error estimates incorporating sample design effects are given in Table H-12 in Appendix H. Estimates are made using mean values of the population.

SOURCE: National Center for Health Services Research and Health Care Technology Assessment, National Medical Care Expenditure Survey, Health Insurance/Employer Survey Data, 1977

Table 13. Mean annual expenditures for prescribed medicines and prescriptions obtained by persons 18 to 64 years of age: Estimated impact of major medical insurance coverage (NMCES HIES Data, 1977)

Health insurance coverage[a]	Probability of obtaining a prescription	Number of prescriptions for persons with at least one prescription	Expenditures per person with prescription expenditures	Charge per prescription for prescriptions with charges
Estimates without controls[b]				
No Insurance	.441	4.32	24.25	5.46
Major Medical Coverage				
No prescription coverage	.541	4.79*	**	6.02
Prescription coverage	.621	4.37	25.15	5.62
High deductible	.585*	4.42*	**	5.93
Medium deductible	.634	4.44	24.69*	5.49
Low deductible	.630	4.15	25.53*	5.73
Estimates with controls[b]				
No Insurance	.569	4.05	22.17	5.38
Major Medical Coverage				
No prescription coverage	**	4.51*	**	5.97
Prescription coverage	.630	4.19	24.13	5.68
High deductible	.568*	4.34*	**	5.93
Medium deductible	.640	4.17	23.23*	5.53
Low deductible	.647	4.15	24.69*	5.80

[a]There were 4,217 persons aged 18-64 years in the sample without health insurance or with major medical coverage only. Using weighted data, approximately 49 percent of these had no health insurance during the entire year, 5 percent had only major medical coverage for the entire year without any coverage of prescribed medicines, and approximately 46 percent had only major medical coverage which included coverage of prescribed medicines for the entire year. Among the latter group with deductible coverage for outpatient prescriptions, 12 percent had high deductibles (greater than $100), 54 percent had medium deductibles (greater than $50 and less than or equal to $100), and 34 percent had low deductibles (greater than 0 and less than or equal to $50). The sample of persons aged 65 years and over with major medical coverage only was too small for statistical analysis.

[b]Controls include age, gender, race/ethnicity, family income related to poverty status, self-perceived health status, region, years of school completed, marital status, number of days during year with illness or injury, duration in months of activity limitation during and before survey year, and number of outpatient physician contacts including telephone calls with or without charges.

*Relative standard error is equal to or greater than 30 percent and less than 50 percent.

**Relative standard error is equal to or greater than 50 percent, and the estimate is not reported.

Note: Standard error estimates incorporating sample design effects are given in Table H-13 in Appendix H. Estimates are made using mean values of the population.

SOURCE: National Center for Health Services Research and Health Care Technology Assessment, National Medical Care Expenditure Survey, Health Insurance/Employer Survey Data, 1977

Table 14. Mean annual expenditures for prescribed medicines and prescriptions obtained by persons 18 to 64 years of age: Estimated impact of basic and major medical insurance coverage (NMCES HIES Data, 1977)

Health insurance coverage[a]	Probability of obtaining a prescription	Number of prescriptions for persons with at least one prescription	Expenditures per person with prescription expenditures	Charge per prescription for prescriptions with charges
		Estimates without controls[b]		
No Insurance	.278*	4.51	25.61*	5.50
Basic and Major Medical Coverage				
No prescription coverage	.396*	5.12*	**	5.65
Prescription Coverage	.684	4.92	28.63	5.62
Low first dollar	d	4.72*	**	5.46
High first dollar	d	4.71*	**	5.25
High deductible	d	4.83	28.66*	5.67
Medium deductible	d	4.89	28.62	5.63
Low deductible	d	5.10	30.20	5.74
		Estimates with controls[b]		
No Insurance	**	4.28	23.95*	5.50
Basic and Major Medical Coverage				
No prescription coverage	**	4.63	**	5.62
Prescription coverage	.740	4.59	26.27	5.61
Low first dollar	c	4.53*	**	5.46
High first dollar	c	4.34*	23.39*	5.25
High deductible	c	4.56	26.85	5.69
Medium deductible	c	4.56	26.28	5.62
Low deductible	c	4.74	27.44	5.70

[a]There were 9,324 persons aged 18-64 years in the sample without health insurance or with both basic and major medical coverage. Using weighted data, approximately 16 percent of these had no health insurance during the entire year, approximately 5 percent had both basic and major medical insurance coverage for the entire year without any coverage of prescribed medicines, and approximately 79 percent had both kinds of coverage and either basic or major medical coverage of prescribed medicines. Among the latter group with either first dollar or deductible plan coverage of outpatient prescriptions, 2 percent had low first dollar coverage (coinsurance rate greater than 10 percent), 5 percent had high first dollar coverage (coinsurance rate less than or equal to 10 percent or copayment amount greater than zero and less than or equal to $3), 6 percent had high deductibles (greater than $100), 64 percent had medium deductibles (greater than $50 and less than or equal to $100), and 23 percent had low deductibles (greater than 0 and less than or equal to $50).

[b]Controls include age, gender, race/ethnicity, family income related to poverty status, self-perceived health status, region, years of school completed, marital status, number of days during year with illness or injury, duration in months of activity limitation during and before survey year, and number of outpatient physician contacts including telephone calls with or without charges.

[c]Not estimated because appropriate multiple choice logit software incorporating design effects does not exist. This software was needed because of the selection bias that was found in these equations for this group. Appropriate logit software incorporating design effects was available to correct for selection bias in the models that did not include choice of prescription insurance by generosity of coverage.

*Relative standard error is equal to or greater than 30 percent and less than 50 percent.

**Relative standard error is equal to or greater than 50 percent, and the estimate is not reported.

Note: Standard error estimates incorporating sample design effects are given in Table H-14 in Appendix H. Estimates are made using mean values of the population.

SOURCE: National Center for Health Services Research and Health Care Technology Assessment, National Medical Care Expenditure Survey, Health Insurance/Employer Survey Data, 1977

Table 15. Mean annual expenditures for prescribed medicines and prescriptions obtained by persons 65 years of age and older: Estimated impact of basic and major medical health insurance coverage (NMCES HIES Data, 1977)

Health insurance coverage[a]	Probability of obtaining a prescription	Number of prescriptions for persons with at least one prescription	Expenditures per person with prescription expenditures	Charge per prescription for prescriptions with charges
Estimates without controls[b]				
Basic and Major Medical Coverage				
No prescription coverage	.830	10.81	68.44	6.39
Prescription coverage	.819	10.37	66.37	6.15
First dollar	.829*	11.00*	68.99*	6.01
Medium/High deductible	.814*	9.59	62.27	6.10
Low deductible	.806*	12.09*	85.89	6.96
Estimates with controls[b]				
Basic and Major Medical Coverage				
No prescription coverage	.932*	9.96	64.22	6.20
Prescription coverage	.948*	10.01	63.10	6.23
First dollar	**	10.95	66.49	5.95
Medium/High deductible	.949*	8.98	55.86	5.96
Low deductible	.925*	11.20	75.74	6.83

[a]There were 528 persons 65 years of age or older in the sample with both basic and major medical coverage. Using weighted data, approximately 27 percent of these had both basic and major medical insurance coverage for the entire year without any coverage of prescribed medicines, and approximately 73 percent had both kinds of coverage and either basic or major medical coverage of prescribed medicines. Among the latter group with either first dollar or deductible plan coverage of outpatient prescriptions, 23 percent had first dollar coverage (coinsurance rate greater than zero or copayment amount greater than zero and less than or equal to $3), 56 percent had medium or high deductibles (greater than $50), and 21 percent had low deductibles (greater than 0 and less than or equal to $50). The sample of elderly persons without any health insurance for the entire year was too small for estimation.

[b]Controls include age, gender, race/ethnicity, family income related to poverty status, self-perceived health status, region, years of school completed, marital status, number of days during year with illness or injury, duration in months of activity limitation during and before survey year, and number of outpatient physician contacts including telephone calls with or without charges.

*Relative standard error is equal to or greater than 30 percent and less than 50 percent.

**Relative standard error is equal to or greater than 50 percent, and the estimate is not reported.

Note: Standard error estimates incorporating sample design effects are given in Table H-15 in Appendix H. Estimates are made using mean values of the population.

SOURCE: National Center for Health Services Research and Health Care Technology Assessment, National Medical Care Expenditure Survey, Health Insurance/Employer Survey Data, 1977

Table 16. Mean number of prescriptions per person: NMES Medicare beneficiaries and Medco beneficiaries 65 years of age and over, 1987

	Mean number of prescriptions per person	
	NMES	Medco
Males		
65-69	12.0	17.0
70-74	13.8	19.1
75-79	13.5	21.0
80-84	15.9	21.5
85+	13.5	20.5
Females		
65-69	14.3	17.8
70-74	16.9	19.5
75-79	17.2	21.7
80-84	19.0	23.0
85+	15.2	20.4

SOURCE: National Center for Health Services Research and Health Care Technology Assessment, National Medical Expenditure Survey and Medco Containment Services, Inc.

Table 17. Annual utilization for Medicare beneficiaries, age 65 and older based on NMES and Medco average number of prescriptions per person

	Population estimate (in thousands)	Total annual number of prescriptions	
		NMES rate (in millions)	Medco rate (in millions)
Males			
65-69	4,212.0	50.5	71.6
70-74	3,184.5	43.9	60.8
75-79	2,077.4	28.0	43.6
80-84	1,126.0	17.9	24.2
85+	681.6	9.2	14.0
Females			
65-69	5,132.8	73.4	91.3
70-74	4,274.4	72.2	83.4
75-79	3,093.9	53.2	67.1
80-84	2,139.0	40.6	49.2
85+	1,499.0	22.8	30.6
Total	27,420.6	411.7	535.8

SOURCE: National Center for Health Services Research and Health Care Technology Assessment, National Medical Expenditure Survey and Medco Containment Services, Inc.

REFERENCES

Andersen, R., Kasper, J., Frankel, M., and Associates, Total Survey Error. San Francisco: Jossey-Bass, 1979.

Baum, C., Kennedy, D., Knapp, D., Faich, G., and Anello, C., Drug Utilization in the U.S.-1986, Department of Health and Human Services, 1987.

Bloom, B., Wierz, D., and Pauly, M., "Cost and Price of Comparable Branded and Generic Pharmaceuticals", Journal of the American Medical Association, Vol 256, No. 18, 2523-2530, 1986.

Bureau of the Census, Statistical Abstract of the United States: 1988. Washington, D.C., 1987.

Cannell, C.F., Fisher, G., and Bakker, T., "Reporting of Hospitalizations in the Health Interview Survey". Washington, D.C. PHS Vital and Health Statistics, Series 2, No. 6, 1965.

Cantor, J., "National Medical Care Expenditure Survey Health Insurance/Employer Survey Data: Premium and Benefits of Persons Under 65, Person Level SAS Files" (data tape), 1987.

Cartwright, W., Hu, T., and Huang, L., "The Impact of Varying Medigap Insurance Coverage on the Use of Medical Services of the Elderly", unpublished manuscript, 1988.

Chu, A., Mohadjer, L., Morganstein, D., and Rhoads, M., NASSREG (National Accident Sampling System Regression), Internal Westat Report, Rockville, Maryland, 1985.

Cohen, S. and Farley, P., "NMCES Methods and Sample Weights Used in the Health Insurance Surveys", NHCES Instruments and Procedures Series No. 3, Washington, D.C., 1984.

Cohen, S.B., Burt, V.L., and Jones, G.K., "Efficiencies in Variance Estimation Strategies for Complex Survey Data," The American Statistician, 40:157-164, 1986.

Cohen, S.B., and Kalsbeek, W.D., National Medical Expenditure Survey: Estimation and Sampling Variances in the Household Survey. National Center for Health Services Research, Instruments and Procedures Series, No. 2. Department of Health and Human Services Publication No. (PHS) 81-3281. Washington, D.C.: Government Printing Office, 1981.

Cohen, S.B., Design Effect Variation in the National Medical Care Expenditure Survey. Proceedings of the Section on Survey Research, American Statistical Association, 748-756, 1983.

Cohen, S., DiGaetano, R., and Waksberg, J., "Sample Design of the National Medical Expenditure Survey-Household Component", Proceeding of the Section on Survey Research, American Statistical Association, 1987.

Cox, B.G. and Cohen, S.B., Methodological Issues for Health Care Surveys. New York, Basel: Marcel Dekker, Inc., 1985.

DiGaetano, Ralph, "Sampling Report for the Selection of Dwelling Units for the Household Survey of the NMES", NMES Report No. 1.0, Westat, Inc., Rockville, MD, 1987.

Grindstaff, G., Hirsh, B., and Silverman, H., "Medicare: Use of Prescription Drugs by Aged Persons Enrolled for Supplementary Medical Insurance, 1967-1977". Health Care Financing Program Statistics. HCFA Pub. No. 03080. Office of Research, Demonstrations, and Statistics, Health Care Financing Administration. Washington, D.C., 1981.

Hausman, J., "Specification Tests in Econometrics", Econometrica, Vol 46, No. 6, pp. 1251-1271, 1978.

Hidiroglou, M.A., Fuller, W.A., and Hickman, R., SUPERCARP (6th ed.). Ames, Iowa: Iowa State University, Survey Section, Statistical Laboratory, 1980.

Holt, M.M., "SURREGR: Standard Errors of Regression Coefficients From Sample Survey Data." Technical report, Research Triangle Park, North Carolina: Research Triangle Institute, 1977.

Iannacchione, Vincent, "Weighted Sequential Hot Deck Imputation Macros", paper presented at the Seventh Annual SAS User's Group Internation Conference, 1982.

Jones, G.K., "HESBRR" (HES Variance and Crosstabulation Program, Version 3). Unpublished report, Hyattsville, Maryland: National Center for Health Statistics, 1983.

Kasper, J. A., "Prescribed Medicines: Use, Expenditures, and Sources of Payment", National Health Care Expenditures Study, Data Preview 9. DHHS Pub No. (PHS) 82-3320, Public Health Service, Washington, D.C., 1982.

Kish, L., Survey Sampling. New York: Wiley, 1965.

Knapp, D., "Paying for Outpatient Prescription Drugs and Related Services in Third-Party Programs", Medical Care Review, Vol. 28, pp.826-859, 1971.

Koch, Hugo K., "The Collection and Processing of Drug Information: National Ambulatory Medical Care Survey, United States, 1980". Vital and Health Statistics, Series 2, No. 90, DHHS Pub. No. (PHS) 82-1364, Public Health Service, Washington, D.C., March, 1982.

LaVange, L., and Silverman, H., "Outpatient Prescription Drug Utilization and Expenditure Patterns of Noninstitutionalized Aged Medicare Beneficiearies". National Medical Care Utilization and Expenditure Survey, Series B, Descriptive Report No. 12, DHHS Pub. No. 86-20212, Washington, D.C., 1987.

Leibowitz, A., Manning, W., and Newhouse, J., "The Demand for Prescription Drugs as a Function of Cost-Sharing", Social Science Medicine, Vol. 21, No., 10, pp. 1063-1069, 1985.

Lingle, E., Kirk, K., and Kelly, W., "The Impact of Outpatient Drug Benefits on the Use and Costs of Health Care Services for the Elderly", Inquiry, Vol. 24, No. 3, pp. 203-211, 1987.

Madow, W. G., "Interview Data on Chronic Conditions Compared with Information Dervied from Medical Records", Washington, D.C.: PHS Vital and Health Statistics, Series 2, No. 23, 1967.

Marquis, K.H., Record Check Validity of Survey Responses: A Reassessment of Bias in Reports of Hospitalizations. Santa Monica, CA: Rand Corporation, 1978.

Mueller, C. and Monheit, A., " Insurance Coverage and the Demand for Dental Care", Journal of Health Economics, Vol. 7, pp. 59-72, 1988.

Reeder, C. and Nelson, A., "The Differential Impact of Copayment on Drug Use in a Medicaid Population", Inquiry, 22, pp. 396-403, 1985.

Shah, B.V., "SESUDAAN: Standard Errors Program for Computing of Standardized Rates From Sample Survey Data." Technical report, Research Triangle Park, North Carolina: Research Triangle Institute, 1981a.

Shah, B.V., "RATIOEST: Standard Errors Program for Computing Ratio Estimates for Sample Survey Data." Technical report, Research Triangle Park, North Carolina: Research Triangle Institute, 1981b.

Van Eck, N, "OSIRIS IV User's Manual: Fifth Edition. Survey Research Center, Institute for Social Research, The University of Michigan, Ann Arbor, MI, 1979.

Van Norstrand, J., Zappolo, A., Hing, E., Bloom, B., Hirsch, B., and Foley, D., "The National Nursing Home Survey: 1977 Summary of the United States". Vital and Health Statistics. Series 13-No. 43, DHEW Pub. No. 79-1794. National Center for Health Statistics, Public Health Service. Washington, D.C., 1979.

TECHNICAL APPENDIX A: DEFINITION OF TERMS, MEASURES, AND INDICATORS

TECHNICAL APPENDIX A: DEFINITION OF TERMS, MEASURES, AND INDICATORS

A.1 Terms Relating to Prescription Medicines and Their Use

Prescribed medicine: Any kind of drug, medication, or biological agent reported in the NMES Household Survey as prescribed by a physician. The number of prescriptions refers to the total number of times a respondent purchased or otherwise obtained the medication, including refills of previous prescriptions and those obtained free of charge.

Use of prescribed medicines: The questions asked of NMES respondents were (1) "Did you have any prescriptions refilled?" and (2) Did you buy or obtain any kind of medicine prescribed by a doctor?". The estimates in this report are, therefore, restricted to prescriptions purchased or obtained by survey participants covered by Medicare. No assumption of compliance is inferred in the terms "use" or "utilization" in this report.

Annual expenditures: The sum of charges for prescribed medicines obtained during the period January 1, 1987 to December 31, 1987. Includes medications that were obtained free of charge. Charge refers to the total charge for the prescription, including all amounts paid by health insurance and other sources of payment. Only charges for prescriptions purchased or obtained while covered by Medicare are included in this report.

Therapeutic function: The medical use for which the medication was prescribed. Each prescription was classified in one of the therapeutic function categories of the American Society of Hospital Pharmacists, the American Hospital Formulary Service. (Pharmacologic-Therapeutic Classification Data used with permission© 1988 American Society of Hospital Pharmacists.) The major categories are as follows:

Antihistamine Drugs

Anti-Infective Agents

Antineoplastic Agents

Autonomic Drugs

Blood Derivatives

Blood Formation and Coagulation Drugs

Cardiovascular Drugs

Central Nervous System Drugs

Contraceptives

Dental Agents

Diagnostic Agents

Disinfectants

Electrolytic, Caloric and Water Balance

Enzymes

Antitussives, Expectorants, and Mucyolytic Agents

Eye, Ear, Nose, and Throat Preparations

Gastrointestinal Drugs

Gold Compounds

Heavy Metal Antagonists

Hormones and Synthetic Substitutes

Local Anesthetics

Oxytocics

Radioactive Agents

Serums, Toxoids, and Vaccines

Skin and Mucous Membrane Agents

Smooth Muscle Relaxants

Vitamins

Other

Generic drugs: Drugs that are not sold under any brand name and drugs that are not trademarked.

A.2 Population Characteristics

Age: The age of the NMES population as of January 1, 1987. Individuals aged 64 as of January 1 (and thus became 65 during the year) are included in the category "less than 65".

Gender: The gender of each survey participant was noted by the NMES interviewer based on the person's first name or by observation. If the gender was not obvious by name, the respondent was asked "Is (Name) male or female?".

Difficulties with Activities of Daily Living: This measure is the sum of the number of Activity of Daily Living (ADL) functions for which the person reported having difficulty. ADL questions are asked in the Long Term Care Supplement and are here focused on bathing, dressing, transferring, toileting and feeding ability.

Perceived Health Status: Respondent's judgment of the health status of the person relative to other people of the same age.

Ethnic/Racial Background: Classification by ethnic/racial background was based on self-reported information. Respondents were asked if their racial background was best described as American Indian, Alaska Native, Asian or Pacific Islander, black, white, or other. They were also asked if their main national origin or ancestry was among one of the following: Puerto Rican, Cuban, Mexican, Mexicano, Mexican American, Chicano, Other Latin American or Other Spanish. All persons who claimed origin or ancestry in one of these groups was classified as Hispanic, regardless of racial background.

Education: This question was asked only for individuals 17 years of age and older and indicates the number of years of schooling completed.

Employment Status: Based only on data collected during the first round of interviewing (January - May, 1987). Indicates that the person was employed at any time prior to the first round interview.

Medicare Beneficiary: Defined as an individual reporting coverage by Medicare at any time during 1987.

Health Insurance Status: Medicaid, private insurance and CHAMPUS/CHAMPVA coverage based only on data collected in the first round of interviewing. Private health insurance was defined as any health insurance plan, including an HMO but excluding extra cash and disease policies, that pays hospital bills, doctor bills, or surgeon bills (not including Medicare, Medicaid, CHAMPUS, CHAMPVA or other public programs).

Family income related to poverty status: Each person was classified according to the total 1987 income of his or her family (family membership as of the time of the fourth interview). Personal income from all family members was summed to create family level income. Possible sources of income were:

Wages or salary

Tips, commissions, or bonuses

Social Security payments

Supplemental security income

Interest on saving/dividends

Veteran's payments

Unemployment compensation

Worker's compensation

Welfare payments

Net rental

Private pensions

Federal Government employee pensions

Military retirement pay

Railroad retirement pay

State or local government employee pensions

Cash contributions

Dividends

Net gains from sale of nonhome assets

Estates/trusts

Annuities

Royalties

Farm self-employment

Nonfarm self-employment

Alimony

Child support

Within a household, all individuals related by blood, marriage, adoption, or foster care status are considered a family. Family income as related to poverty status is the ratio of family income to the 1987 poverty levels published by the Bureau of the Census, controlling for family size and age of head of family. The poverty levels for 1987 are:

One person, less than 65 years or older	$5,909
One person, 65 years or older	5,447
Two persons, less than 65 years	7,641
Two persons, 65 years or older	6,872
Three persons	9,056
Four persons	11,611
Five persons	13,737
Six persons	15,509
Seven persons	17,649

Eight persons	19,515
Nine persons or more	23,105

U.S. Census Region: States are grouped into four regions by the Census Bureau. The groupings are:

Northeast: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, and Pennsylvania.

North Central: Michigan, Wisconsin, Ohio, Indiana, Illinois, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, and Kansas.

South: Delaware, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, and Texas.

West: Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada, Washington, Oregon, California, Alaska, and Hawaii.

A.3 Medical Conditions

Condition Classification: Self-reported information concerning medical diagnosis, related history, and parts of the body affected by the condition were used to code each condition associated with the reported use of prescribed medicine(s) according to the International Classification of Diseases, revised for use in coding the National Health Interview Survey (ICD9-HIS).

TECHNICAL APPENDIX B: HOUSEHOLD SURVEY SAMPLE DESIGN AND DATA COLLECTION

TECHNICAL APPENDIX B: HOUSEHOLD SURVEY SAMPLE DESIGN AND DATA COLLECTION

B.1 Household Survey Sample Design

The Household Survey (HHS) sample was designed to produce unbiased national estimates for the general population, for population subgroups of special policy interest, and for the U.S. Census regions. The sample is a stratified area probability design with four stages of sample selection: (1) selection of primary sample units (PSUs); (2) selection of segments within PSUs; (3) selection and screening of households within segments; and (4) selection of households based on demographic characteristics (both household and individual) from the set of screened households. The sample of PSUs represents a union of the national sample frames of Westat, Inc. and NORC.

The NMES design required selective oversampling of blacks, Hispanics, the poor and near poor, those 65 years of age and older, and the functionally limited or impaired. A separate screening interview was used to facilitate sample identification of these population subgroups. Within each primary sampling unit (PSU) a two- or three-stage sample design was used to select households for a screening interview conducted in October and November, 1986. The sampling and subsampling rates were such that within a particular PSU, all households or persons in group quarters had an identical probability of selection. Interviewers determined whether selected dwelling units were eligible for the screening interview (thtat is, occupied on other than a seasonal basis) and conducted the interview in eligible units.

The screener sample consisted of dwelling units, although the basic analysis units are reporting units and persons. The sample dwelling units (DUs) include housing units, group quarters, and other noninstitutional (non-group) living quarters. Dwelling units consist of one or more reporting units. A reporting unit (RU) is defined as a group of individuals, related by blood, marriage, or adoption, residing in the same housing unit. All members of the civilian population who considered the selected DU as their usual place of residence were included in the interview. Also included in a sample household within the dwelling units were persons considered to be a part of the household but who were temporarily residing elsewhere. Unmarried college students under 22 were selected at their parents' sample address rather than at college in order to allow for the derivation of health care utilization and expenditure estimates at the family level.

The final NMES household screener sample consisted of 35,634 addresses, of which 3,091 were identified as vacant and another 1,085 identified as not a dwelling unit. The large number of units to be screened was driven by the precision specifications for the rarest population subgroups (in this case, black, elderly, poor). Of the 31,458 dwelling units eligible for the NMES, 28,708 responded to the screener interview. A dwelling unit was classified as responding if any of its component reporting units completed the screener interview. The NMES household screener response rate was 91.3 percent.

The NMES Round 1 household sample was selected after the data collection phase for the screening interview was completed and all relevant demographic data necessary for the sample selection of dwelling units were processed. The Round 1 household sample of dwelling units was selected by the following sampling strategy (DiGaetano, 1987):

1. Each screened dwelling unit (DU) was classified into one of the ten sampling categories based on the demographic characteristics of its "highest priority" individual. This was the household member requiring the highest sampling rate to meet sample size targets. The sampling rate was defined as the ratio of the required number of individuals in a sampling class to the available number of screener respondents. The sampling classes presented in Table B-1 are arranged in order of highest priority.

2. A systematic sample of DUs was then selected from the highest priority class using the person level sampling rates.

3. The number of individuals in all sampled DUs possessing the demographic characteristics that defined the remaining sampling classes was counted. The sample size requirements for the remaining sampling classes were then reduced by these enumerated totals.

4. Sampled DUs were then removed from the sampling process.

5. DUs associated with the next highest priority sampling class were then selected at a sampling rate designed to meet the adjusted sample size requirements, repeating the process outlined above.

6. The sampling process was repeated until all ten sampling categories were sampled.

The resulting sample consisted of 15,130 dwelling units with 39,831 individuals.

Table B-1. Sample domains and sizes

	Demographic group	Number of people	Number of DUs
1.	Black, less than 65 years	7,735	2,730
2.	Black, 65 years or older	731	325
3.	Functionally impaired, 65 years or older	1,148	943
4.	Hispanic, 65 years or older	206	136
5.	Hispanic, less than 65 years	4,094	1,638
6.	White, 65-79 years	4,338	2,661
7.	White, 80 years or older	1,020	376
8.	White, less than 65 years, at or below poverty level or near poor	5,424	1,829
9.	Other ethnic or racial groups at or below poverty level	280	61
10.	White, less than 65 years, other income, other races, near poor or other income	16,003	4,796
	TOTAL	39,831	15,130

To eliminate the bias associated with sampling dwelling units not occupied in the fall of 1986, a sample of vacant addresses was selected to supplement the occupied addresses sampledfrom the responding screened households. It was assumed that the number of vacant addresses becoming occupied would compensate for the number of occupied dwelling units becoming vacant in Round 1. The set of 3,091 addresses identified as vacant during the screener field period were classified into one of four categories, based on the dominant demographic characteristic of the sample segments from which the vacant addresses were drawn. The four classes were defined as black, Hispanic, white-poor, and white-other income. The sampling procedure resulted in the inclusion of 1,464 vacant addresses being selected for the Round 1 sample, representing approximately 8 percent of the Round 1 sample. (The vacancy rate for dwelling units in the United States is approximately 8 percent, Bureau of Census, 1987.)

A supplemental sample of refusals to the screener and other nonresponding dwelling units was included to further improve the overall NMES response rate. Refusals and other nonresponding dwelling units were classified into the same four strata used for vacant addresses. A sample of 645 DUs categorized as refusals to the screener were then selected from the 1,600 eligible DUs and a sample of 376 DUs categorized as other nonresponding DUs were selected from 916 eligible DUs with this classification (see Table B-2). Further details concerning the design of the HHS component can be found in Cohen, DiGaetano, and Waksberg, 1987.

Table B-2. NMES Round One sample

Final screener interview	DU totals	Percent of eligible DUs	NMES Round 1 sample
Eligible Dwelling Units			
Responding to screener[a]	28,458	91.19	15,130
Refusals	1,600	5.13	645
Nonrespondents (not home after 4 calls, unavailable during screener field period, too ill)	916	2.94	376
Remaining nonrespondents	234	0.75	0
TOTAL	31,208	100.0	16,151
Vacant Dwelling Units	3,091		1464

[a]Another 250 responding DUs were associated with active duty military personnel or students.

B.2 Data Collection

The HHS component included five rounds of interviews, beginning in February 1987, and continuing into July 1988, so as to provide a full set of annual data on of use and expenditures, health insurance coverage, employment, income, and related characteristics of survey participants for the reference period, January 1, 1987, to December 31, 1987. The interview was conducted in

person for Rounds 1, 2 and 4 and, for most respondents, by telephone, for Rounds 3 and 5. Each interview for Rounds 1 to 4 consisted of a core interview with the following components:

- Verification of reporting unit composition, including the collection of demographic information for new reporting unit members;
- Administration of the Central Questionnaire to identify disability days, visits to all types of sites and providers of medical care, use of prescribed medicines, medical equipment, and other services, health insurance coverage, and employment;
- Administration of additional questionnaires as needed to collect detailed information about charges and sources and amounts of payment for all contacts with dental care providers, emergency rooms, and hospital outpatient departments; providers of home health care; hospital stays; visits to medical providers; prescribed medicines; and other medical expenses;
- Administration of questionnaires as needed to obtain information about all health conditions associated with disability days or the use of services.

The Round 1 interview covered the period from January 1, 1987 up to the date of the interview. Subsequent rounds covered the period from the previous interview to the current interview date, with a final bounding date of December 31, 1987, for the core questionnaire.

Data not obtained in the central questionnaire were collected in supplemental questionnaires. In Rounds 1 and 4, the supplemental questions focused on functional status and, for persons with functional limitations or impairments, use of long-term care services and sources of help within and outside the household. The Round 2 supplement collected information on caregiving for persons identified in the Round 1 interview as primary caregivers of functionally impaired persons. These questions focused on the burden of caregiving and the health status of the impaired person. In Round 3, respondents were questioned about their usual source of medical care and the availability of social supports. The fourth round of interviewing included a supplement concerning sources of income.

HHS participants were also asked to complete a self-administered questionnaire between Rounds 1 and 2 concerning health status, health habits, and health opinions.

The Round 5 interview, conducted between April 15, 1988 and July, 1988, asked about income tax filing status, day care for children, and pregnancy-related items.

Two additional data collection techniques were used to help reduce reporting error due to lack of recall, lack of documentation (such as bills), or double-counting of health events. First, household respondents were asked to maintain a calendar/diary of health events for all reporting unit members for health events occurring after Round 1. Second, the Round 2 and 4 interviews included reviewing a summary of previously reported responses to questionnaire items. The summary included the reports of all utilization and associated charges and payments, insurance coverage, and employment status for all RU members. Interviewers reviewed the summary information as part of the interview, asking particularly for previously unreported information, such as total charge for a medical provider visit, which may have become known in the interim.

The overall response rate for the screening round and Rounds 1 through 4, calculated as the product of the individual round response rates, was 79.7 percent. For a discussion of weighting adjustments for nonresponse and estimation strategies, see Appendix G. For some of the instruments used, see Appendix I.

TECHNICAL APPENDIX C: PRESCRIBED MEDICINE CODING AND QUALITY CONTROL

TECHNICAL APPENDIX C: PRESCRIBED MEDICINE CODING AND QUALITY CONTROL

In the following, the procedures used to code prescribed medicine data obtained in the household survey component of the 1987 National Medical Expenditure Survey are described. Particular attention is given (1) to the basic coding scheme adopted to convert information as recorded by the interviewer into numerical codes, and (2) to the two-tiered system of quality control and verification instituted for NMES prescription medicine coding.

As in most household surveys of health care use and expenditures, it was not possible to code medicines according to the National Drug Code (NDC), the U.S. pharmaceutical industry standard. Most importantly, this is due to the fact that the level of detail (e.g., dosage) necessary for NDC coding is difficult to obtain with sufficient reliability from household respondents. The prescribed medicine information obtained from NMES respondents was restricted to reports of the number of purchases and refills of prescriptions, the name of each medication, associated conditions, and charges and sources of payment. Dosage strength, dosage amount, and quantity (package size) of the medicine were not obtained.

The system adopted for processing prescribed medicine data in NMES was originally developed as part of the 1980 National Ambulatory Medical Care Survey (NAMCS) by the National Center for Health Statistics (Koch, 1982), which is described in detail in the following. Developed for use in coding medicine names generated from a survey of office-based physician practice, the NAMCS scheme provided additional information for each code including generic equivalents, Federal drug control status, composition (single versus compound medications), and its American Hospital Formulary Service classification (i.e., the therapeutic category). In addition, the codes were used in NMES to verify, at least on a general level, expenditure information provided in the household survey and as a basis for imputing missing information on charges.

C.1 The NAMCS Coding Scheme

The NCHS system used the Drug Product Information File (DPIF), a computerized database of commercially available drugs developed, maintained, and continually updated by the

American Society of Hospital Pharmacists, as the primary data source for the NAMCS Drug File. The NAMCS Drug File contains a broad range of detailed information about most commercially available medicines, which are indexed by a Medicine Coding List (MCL) number. This MCL-based system is primarily used in survey research and is distinct from other medication coding indexes currently available such as the National Drug codes (NDC) or the Uniform System of Classification (USC). The elements of the NAMCS file which have been merged onto the NMES data base by the MCL number include the following item-level information:

- Generic Name
- Generic Name Code - created for the NAMCS file with a code corresponding to each generic medicine name.
- Medication Code List (MCL) Name - an inventory of single and multiple source medicines maintained by NCHS.
- Medication Code List number - a numeric code paired with each MCL name.
- Prescription Status Code - identifies the Federal legal classification of the medicine coded as either a prescription medicine (1), a nonprescription medicine (2), or undetermined (3).
- Federal Controlled Substance Status Code (DEA No.) - indicates the degree of potential abuse of the medicine and the level of Federal control.
- Composition Status Code - identifies single and multiple-entity medicines as follows: single-entity medicine (1); combination medicine (2); undetermined (3); multivitamin (5).
- Therapeutic Category Code (AHFS No.) - identifies the therapeutic category of a medicine according to the American Hospital Formulary Service (AHFS).
- Ingredient Codes - identifies the active, generic ingredients in combination medicines adapted from the DPIF.

The medicine names collected in NMES, which were keyed into the database in a character field and were sometimes misspelled, had to be unambiguously identified in terms of some meaningful medicine name. The NAMCS system provides a unique numeric value from the Medication Coding List (MCL) and an associated name to code each medicine. These MCL numbers have no intrinsic meaning but rather should be viewed as reference or index numbers representing all recognized medicine names. In addition, the MCL code serves as the link between the medication name and the detailed information on the NAMCS Drug File.

C.2 NMES Prescription Medicine Coding

Prescribed medicine data from NMES were coded by both WESTAT and the NORC, the organizations responsible for the HHS data collection. Because of NORC's previous experience in prescribed medicine coding for NAMCS, their personnel assumed the responsibility for 75 percent of NMES coding of prescribed medicines, with WESTAT responsible for the remainder. Coding was conducted with the assistance of an interactive computerized data base and retrieval system developed by WESTAT which accessed the NAMCS File and provided the coder with the appropriate MCL number. If computerized retrieval failed, the coder did a manual (hard copy) search of the NAMCS File.

The total number of unique spellings of medication names for the entire NMES sample is 34,896. This includes separate codes for all misspellings and combines various dosage amounts for the same medicine. It is also important to note that this number represents only the number of medication names given by NMES respondents, and not the total number of prescriptions, which totaled over 100,000. After coding, this number was reduced to a total of 2,494 unique drug codes for the total NMES sample and to 1,746 unique codes for the sample used in the analyses in this report. This section will review, in detail, the procedures used to code the medicine names to their appropriate MCL number.

C.2.1 Staffing and Training

Across both contractors, ten persons were involved in the medicine coding either as supervisors (a total of four -- two in each location) or as coders (a total of six; four at NORC and two at WESTAT). The senior supervisor at NORC had previously been coding supervisor for the medicine coding on NAMCS. The other supervisors had direct experience in other types of coding (including industry and occupation coding) as well as experience across many components of NMES. Supervisors and coders participated in a 2-day training course conducted by the senior supervisor at NORC, which covered all aspects of coding including general decision rules, use of the computerized lookup system and of reference materials (e.g., The American Drug Index, 1988; Physician's Desk Reference, 1988; Physician's Desk Reference of Non-Prescription Drugs, 1988), and quality control. Each person involved in the coding was provided a manual which summarized the task; in addition, coders had a hard copy of the MCL for reference. (Training materials are available upon request from NCHSR.)

C.2.2 General Coding Procedures

The coding procedures combined an automated coding system (Computer Assisted Coding or CAC) with manual look-up and retrieval. The process for medicine coding is summarized below:

1. The coders worked through an alphabetized list of drug spellings contained in an on-line database stored in a DEC-VAX system.

2. The VAX interfaces with the CAC in order to feed a medicine name to the coder for coding.

3. The CAC system, developed by WESTAT, is a multi-screen dictionary lookup system on networked IBM-PCs. The coder either has the system look up the medicine name exactly as it is recorded in the data base or edits the medicine name for spelling or transcription errors to enable the system to search for the code in its dictionary. Once a code is found in the system, or is found manually in the hard-copy MCL, the coder enters a code in the fields provided. The system will not allow the coder to enter more than the correct number of digits. The system will then confirm the code and the associated medicine name found in the CAC dictionary. If the coder is either unable to code the medicine because it is illegible, not on the MCL, or further information or supervisor review is needed, the coder flags the case in the system and the supervisor reviews and generates a code.

4. Supervisor review and verification of all medicine entries and their coding is implemented in the first phase of quality control.

5. The medicine name, the assigned code, and flags, if any, travel back into the VAX database through the CAC/VAX interface after supervisor review and verification has been completed.

6. The newly coded spellings are matched back into the NMES Household data base through a link file which identifies every prescription medicine record with that spelling.

7. The second phase of quality control in the coding process is review by pharmacists on a case-by-case basis, using additional information such as the condition for which the medicine was prescribed.

C.2.3 Levels of Coding

Coding proceeded from three types of raw data in the NMES data base: (1) unambiguous and easily interpretable spellings of medicine names which could be given an MCL

number; (2) unclear or garbled spellings which were flagged for supervisor review; or (3) general information instead of an actual medication name; for example, "a drug for my arthritis" would be coded to the American Hospital Formulary Service (AHFS) classification system for therapeutic categories (TC).

Coders were required to flag several different types of codes for supervisor review including: (1) uncertain codes (a log was kept for possible but not certain codes); (2) cases coded as either "Illegible," or "Other;" and (3) all cases coded to therapeutic categories. These cases went into a cue for supervisor review. All unflagged cases were verified by the supervisor and counted towards coder's error rate.

C.2.4 Supervisor Verification

Quality control consisted of two complementary steps. Supervisors verified 100 percent of the medicine codes assigned by each coder which were not flagged for review (or 82.8 percent of all medicines coded). The supervisors did not independently code all medicine names and then compare codes. Rather, dependent verification was performed. Supervisors examined the code assigned and decided whether the code was correct and, if incorrect, changed the code. The corrected code was keyed into the data base along with an indicator that flagged the code as changed. Supervisor verification produced a daily error rate for each coder as well as cumulative daily and weekly error rates for the medicine coding overall. Any coder with an unusually high error rate (over 7 percent) on any day was either retrained or released. The mean error rate for the medicine coding generated from supervisor verification was 2.54 percent. Supervisors also reviewed all cases that were flagged by the coders because they (1) were uncertain as to the code; (2) had to code to "Illegible" or "Other" for reasons reviewed above; or (3) coded to therapeutic class as "the best code". Overall, 17.2 percent of the codes were flagged and reviewed. Flagged cases were not counted toward the daily error rate.

C.3 Professional Quality Control

Registered pharmacists both verified coding and provided quality control with additional information not available to the coders. This information included medical conditions

reported in the survey associated with each prescription; the MCL code assigned through the CAC system; the medication name associated with the MCL code; and respondent age and gender.

Internal Review. A licensed pharmacist on the WESTAT staff reviewed all medications assigned for supervisor review (therapeutic class, "other" codes, and "illegible" codes) whether resolved by the supervisor or not. Using additional respondent information, including age and the condition(s) associated with the prescribed medicine, the pharmacist attempted to code these previously "uncodable" medicines to a specific MCL number. As Table C-1 shows, the total number of medicines that fell into these three categories was relatively small when compared to the overall number of prescription medicine records that were coded and reviewed. The WESTAT pharmacist was successful in coding the majority of the medicines to a specific MCL number once other information was provided.

External Review. A team of eight licensed pharmacists was hired through the American Pharmaceutical Association (APhA) to conduct external, dependent verification of 82.8 percent of the medicines which had been previously verified by the supervisors at NORC and WESTAT (exact MCL/NMES spelling matches were excluded). These were the medicines coded to an exact MCL number rather than a therapeutic class, "other", or "illegible" codes. Of the total number of codes reviewed, 4.2 percent were changed as a result of this professional review (see Table C-1).

Table C-1. Pharmacist review and coding

Type of code	Total number reviewed[a]	Total number changed	Percent changed
Therapeutic category[b]	3,297	622	18.9
Other codes[b]	1,638	1,427	87.1
Illegible[b]	3,125	2,895	92.6
All other[c]	55,273	2,336	4.2

[a]The numbers represent all medicines for NMES sample persons aged 55 and over. They thus are larger than the population of Medicare beneficiaries.

[b]Verified and recoded by Westat pharmaceutical review.

[c]Reviewed by team of APhA pharmacists.

A three-hour training session was held at WESTAT for the pharmacists, conducted by a trainer experienced in the Household Survey and the HHS database. In order not to introduce bias, the trainer was not involved in the original coding operations.

Results of Professional Review

The prescribed medicine coding procedures satisfied several goals: (1) to have coders accurately assign MCL codes to verbatim medicine names provided by NMES survey respondents; (2) to further code the NMES medicine data base to the greatest level of detail possible using professional judgement and detailed information about the sample person; and (3) to have a level of professional quality control which quantifies the overall rate of error in the assignment of medicine codes. Of those medicines coded, only 4.2 percent of codes were found to be errors and were corrected by outside pharmacists. Of the 8,060 cases reviewed by the Westat pharmacist, only 8 percent of the total data base remained uncodable to the categories used.

TECHNICAL APPENDIX D:
DATA EDITING AND IMPUTATION

TECHNICAL APPENDIX D: DATA EDITING AND IMPUTATION

This appendix describes the data entry, editing and imputation for the household survey data discussed in this report. This material is presented in the order in which the survey data were processed, beginning with data entry and batch editing by the survey contractor, through the editing process and finally, imputation for missing data.

D.1 Data Entry and Batch Editing

Data entry for the NMES HHS component was completed using the Westat Computer Assisted Data Entry (CADE) system. Data entered using CADE are automatically edited for completeness, consistency, and range checks. CADE automatically controls for skip patterns throughout the questionnaire. Although the data entered through the CADE system are cleaner than data entered through a standard keying process, some data editing is still required prior to analyses. Batch editing is the first step in this process.

Batch editing programs recheck the skip patterns in the data against those specified in the questionnaire and further check the logic and consistency of responses. These programs are designed to check data within a specific section of the questionnaire, across sections of the questionnaire which were collected in a single round, and data collected across rounds of interviewing. For example, batch edits in the present survey include tracking a person across the four rounds of data collection or checking for the accuracy and consistency of age and gender for each person. Two simple examples of edits would be to ensure that the gender designation of a person did not change between rounds of data collection or that a person whose relationship to the reference person is listed as father, was recorded as male. Any skip pattern or logic error that is encountered is listed in a printout and reviewed with the original hard copy of the questionnaire used in the data collection. Once errors are corrected by an editor, the case is resubmitted for batch editing to verify the appropriateness of all changes.

D.2 Editing

Survey data are subject to error from several sources, including respondent error, interviewer error and data entry error. To minimize these errors in the NMES data, several of the variables used in this report were edited further after delivery to NCHSR by the data contractor. Edits of NMES data consisted mainly of checking for inconsistencies, reviewing data for extreme values, and replacement of missing data. Although this report focuses only on Medicare enrollees, most data were edited for the entire NMES file, which consists of approximately 37,000 individuals. The number of cases affected by edits which are cited below may refer either to the number of Medicare enrollees, or to prescriptions purchased by Medicare enrollees, or to the entire NMES data file. The distinction is noted where appropriate. Measures not referenced in the sections below were not edited beyond the batch editing described above.

D.2.1 Prescription Medicine, Frequency of Purchase, and Total Charges

Although the estimates discussed in this report generally focus on annual utilization and expenditures for prescription medicines, the data were collected for each prescription for each reference period on an individual basis. Respondents were asked to report separately on each medicine obtained or purchased and provide details concerning total charges and conditions for which the medicine was obtained (see Appendix B). The name of the medicine, the frequency of purchase within the reference period, and the total charges associated with all purchases of the specific medicine are the primary analytic measures of interest.

As noted in Appendix C, the coding of respondent reports of prescription medicines was verified by a group of pharmacists. No further editing of the medication name was done. For each medicine, the respondent was asked to report how many times the medicine was obtained or purchased between the starting date and the ending date of the reference period. In 216 out of 113,000 prescription records for the entire NMES file, the frequency of purchase within a reference period exceeded 5 times; these cases were reviewed to determine the accuracy of the data. For 20 of these cases, the frequency of purchase was determined to be a data entry error and the value was changed. For example, one prescription was reported to have been purchased 30 times during the reference period. Upon examination of the medication type and the person's

purchases of the same medication in other rounds of data collection, the frequency was changed to 3 times.

In order to obtain a complete annual profile of health care utilization and expenditures, data for the last quarter of 1987 were collected during the first few months of 1988. This led to the erroneous inclusion of some prescriptions purchased or obtained in 1988. To eliminate these cases, the frequency of purchase was adjusted according to the ratio of the number of days for which the medicine was taken in 1987 to the total number of days that the medicine was taken. For example, if the respondent reported taking a prescription beginning December 1, 1987 and ending February 1, 1988 and had purchased the prescription twice, then the frequency of purchase was multiplied by the ratio of 1987 days to total number of days (e.g., $2 \times 31/62 = 2 \times 1/2 = 1$). Non-integer values were rounded to the nearest whole number and no adjustment was made if the respondent reported purchasing the prescription only once during the reference period. All prescriptions for which both the first and last date of consumption were in 1988 were eliminated from the analyses.

Respondents were asked to report the total charge for all purchases of a particular prescription during the reference period. Total charge was defined for the respondent to include the amount paid out of pocket as well as the summation of all payments made by third parties. Editing of the total charge variable focused on two types of misreporting: (1) reports by respondents covered by insurance who reported the 'copay' amount as the total charge or the prescription; and (2) reports by respondents who purchased the prescription more than once during the reference period but who reported the cost per purchase as the total charge rather than the sum of all purchases.

Editing began by creating a measure of the average charge per purchase. The use of charge per prescription, that is the total charge divided by the frequency of purchase, permitted comparisons across prescriptions based on a common unit measure, a single prescription. All prescriptions for those with more than one type of prescription where the charge per prescription did not change and was less than or equal to $6.00, were flagged as potentially representing copay amounts. Similarly, for those respondents who reported only one type of prescription, data were compared across family members to determine if charges were equal and less than $6.00 for different prescriptions within the family. For example, an individual who reported a charge of $5.00 for two different prescriptions would have been flagged as potentially reporting a copay

amount and all prescriptions for this person would have been reviewed. For those prescriptions where it was clear that the values reflected a copay amount, the charges were set to missing and the total charge imputed. Of the 6,038 individuals used in this analyses, 91 (or 1.5 percent) reported a copay value for every prescription. Less than 5 percent of the prescriptions were affected by this edit.

Extreme values of the calculated charge per prescription, either low or high, were used to detect those cases where the respondent had reported the charge per purchase instead of the total charges associated with all purchases of a prescription. Within each prescription category (see Appendix C for a description of classification system), the mean charges per prescription were calculated. All prescriptions for which the cost per prescription fell outside of the 5 percent and 95 percent range were flagged as outliers. For each person with at least one prescription classified as an outlier, all prescriptions for that person were listed and reviewed by a registered pharmacist (see Appendix C). For example, a respondent may have reported a total charge of $7.50 for four purchases of Lasix, resulting in a calculated charge per prescription of $1.88. In this case, the pharmacist would have changed the value of the charge per prescription from $1.88 to $7.50 as representing the reasonable charge per purchase. The editing of extreme values resulted in changes to the charge per prescription for approximately 2 percent of prescriptions purchased by Medicare recipients.

D.2.2 Population Characteristics

Medicare Beneficiary Population. All individuals who were Medicare beneficiaries at any time during 1987 are included in this report. Any individual who reported Medicare for any round of data collection was included as a Medicare beneficiary. Cases in which the respondent indicated coverage in one round followed by one or more rounds reporting no coverage were reviewed. Approximately 130 individuals reported this type of coverage/noncoverage pattern. Of these, 40 were over the age of 65 and were assigned Medicare coverage, effective as of the earliest round in which they reported Medicare coverage. For the remaining 90 people, neither age nor other information suggested Medicare coverage; these were not considered Medicare beneficiaries. The Medicare status of approximately 175 persons was missing. Approximately 20 of these were 65 years or older and were assigned Medicare according to whether or not they reported Social Security or Railroad Retirement income. The remaining persons were under age

65; these were not assigned to Medicare status unless they reported Social Security Disability payments or Medicare as a source of payment for their care. An additional 150 people were assigned Medicare coverage who had not reported it, either because they were age 65 or older, received Social Security or Railroad Retirement income, or because they reported that Medicare paid for their care.

Demographic Measures: Age, Gender, Ethnic/Racial Background, and Education. Respondents were asked to report both date of birth and age. In the cases where there was an inconsistency between the two measures, priority was given to date of birth. A small number of cases (less than 10) were missing both date of birth and age in all four rounds of data collection; here age was determined as a function of the relationship of the person to other family members. The editing of gender compared the person's gender with the relationship of that person to other family members (e.g., for a person coded as a mother, female gender was checked). Inconsistencies were clarified using the person's first name (less than 10 cases). Racial background (Indian, Alaska Native, Asian or Pacific Islander, Black, White or Other) was cross-classified with national origin to determine any inconsistencies. For the 89 cases (of a base of over 37,000 individuals) for whom background information was missing, information from other family members was used to classify the person. With respect to the measure of education, values for 140 individuals (among 35,000 people) were changed due to what appeared to be data entry errors (e.g., individual with 2 years of education instead of 12 years of education).

Income/Poverty Status. During the fourth round of NMES household interviews, respondents were asked a series of questions regarding the income received by members of the reporting unit (RU) during 1987. These questions were asked only of those RU members living in the unit during the fourth round of the survey. Income of the 222 Medicare beneficiaries who were present in the unit during one of the earlier rounds but not present in the fourth round for whatever reason (change in household composition, death, institutionalization, marital divorce or separation) is not included in this measure of income. Persons who joined the RU after Round 1 are not included in person-level estimates; see Appendix G. Nonetheless their income is included in the measure of family income in order to yield unbiased family-level estimates.

For the 26 sources of income described in Appendix A, each respondent unit was asked if anyone in the family had income from that source. If so, then the person or persons in the RU with income from that source were identified along with the amounts received by each person

during 1987. Depending on its source, income was reported on an annualized basis, on a monthly basis, or either on a quarterly, monthly, or annual basis. For periods less than a year, the respondent was asked to supply the number of periods over which the income was received. If persons reported receiving income on a monthly basis they were asked if they received any other such income on a monthly basis during the year. Data on the number of months for each amount was collected.

For the sample of 5,816 Medicare beneficiaries and their 2,435 family members for whom income data were collected, individual records of persons with income outliers and the records of their family members were reviewed. Income outliers were identified as reported levels of income at or beyond limits that were in the top 5 percent or some higher range of the frequency distribution for a given income source. In some cases, the upper limit for defining an income outlier was at the top percentile or higher because income amounts below the cut-off point were deemed to be reasonable. Data on the socioeconomic characteristics and other income sources of the person with the outlier and of their family members were examined as well. In general, income outliers were not changed unless information available for the person and/or other family members provided strong indication to the contrary. Typically, the number of outliers examined was about 1 percent of the reported nonzero amounts for each income source, and only a fraction of the outliers were changed to different values during the editing.

Employment Status. Employment status refers to whether the individual was employed at any time during the first round of interviewing. Data on private health insurance and employment were only available from Round 1 at the time of this report. Questions concerning employment were asked at several points in the Round 1 questionnaire; responses from these questions were cross-tabulated to determine inconsistencies leading to the identification of approximately 50 cases from a total of 36,000 Round 1 responses. These cases were reviewed to determine the individual's status. National estimates of employment based on NMES and estimates based on the estimates for the month of April 1987 reported by Monthly Labor Review, were 111,729,000 and 111,806,000, respectively. April 1987 was used for the comparison since it represents the mid-point of the Round 1 data collection.

Round 1 Self-Reported Health Insurance. Approximately 50 families (of over 16,000 families responding in Round 1) were missing self-reported information about whether or not they had a private health insurance plan. Private health insurance status was assigned to these on the

basis of their other health insurance coverage (if any), the reported sources of payment for medical expenses incurred by family members, and employment information. Among families reporting private insurance, valid responses with respect to the coverage of each family member under each plan were obtained for 93 percent of the roughly 37,000 person-plan pairs. Coverage was assigned for the remaining pairs based on family relationships and the coverage of other family members, the interviewer's indication that the person had private insurance, and whether the plan was Medigap coverage purchased directly from the insurer.

Round 1 Medicaid status of approximately 150 persons with missing data was inferred from family relationships, receipt of Supplemental Security Income (SSI) and Aid to Families with Dependent Children (AFDC), whether or not Medicaid was reported as a source of payment for a person's medical expenses, employment information, and poverty status of the persons residing in the dwelling unit at the screening interview. Approximately 100 persons who were not identified as having Medicaid but reported having AFDC or SSI and reported elsewhere in the interview that Medicaid paid for their care were assigned Medicaid coverage. Conversely, approximately 50 persons who did not present a valid Medicaid card, did not report AFDC or SSI, and did not identify Medicaid as a payer for care that they reported were assumed not to have coverage.

Approximately 100 persons were missing Round 1 data on CHAMPUS/CHAMPVA coverage. It was assigned according to the military service and military retirement income of family members.

D.3 Imputation

Survey data are not only subject to error but also to item nonresponse. Item nonresponse occurs when no answer is recorded for a question that a respondent should have answered and when an answer is eliminated by an edit check because it is inconsistent with other answers. Imputation is the process of assigning values for the missing values to produce a complete data set. Imputation was used to replace missing data for three measures cited in this report, frequency of purchase for a prescription, charge per prescription, and income.

Frequency of Purchase. Data were missing on frequency of purchase for 1.4 percent of the prescriptions reported during the four interviewing rounds for the entire population.

Among the Medicare population, 1.9 percent of the records were missing this information. Regression models developed to predict the frequency of purchase indicated that the only significant predictor of frequency of purchase within a reference period was the prescription code. Therefore, data for cases where frequency of purchase was missing were replaced with the median value of frequency of purchase within a specific prescription code.

Charge per Prescription. No information on charges per prescription was reported for approximately 35 percent of the prescriptions purchased by Medicare recipients. Item nonresponse resulted from two types of respondents: those who knew the charges at some point but were unable to recall them at the time of the interview and those respondents who were never aware of the charges, because a public payer was the source of payment. (Public payers include but are not limited to Medicaid, the Veterans Administration, the Indian Health Service, the Military, and other state or local programs.) In addition, charges for approximately 6 percent of the cases were set to missing in the editing processes. As noted above, charges were edited to identify instances where the respondent reported a copayment rather than the actual charges or to identify aberrant values.

Regression models were used to identify those measures most highly correlated with the charge per prescription. These measures were the prescription code, the frequency with which the prescription was purchased within a reference period, the region of the country where the respondent lived, and the respondent's health status.

Weighted sequential hot deck imputation (Iannacchione, 1982) was used to replace 79 percent of the cases with missing data. Prescription code was used as a classification variable in this analysis and frequency of purchase, region of the country, and respondent's health status were used as sort variables. Less than 5 percent of the resulting Z-scores, which compared donors, recipients, and overall means per class, were significant. In computing Z-scores for a large number of comparisons, once would expect significant values for a random 5 percent of cases. The small number of significant Z-scores indicates that use of the hot deck procedure was non-biasing in assigning values for previously missing data.

The remaining cases with missing charge data involved instances where there were only a few responses corresponding to a given code. Here, hot deck procedures could not be used

and missing values were replaced by the median value of the cost per prescription within a prescription code classification.

This data replacement strategy did not take into account the source of payment for the prescription. Although there was some concern that such an approach would lead to an overestimation of expenditures for prescriptions paid by Medicaid or other public payers, there is no consistent evidence to suggest that prices are lower when paid by public insurance. A recent publication in the Journal of the American Medical Association (Bloom et al., 1986) indicates "no payment method (cash, Medicaid, or other third party payment) was consistently associated with lower prices of either generic or brand drugs." The authors state that this was unexpected given stringent fee schedules associated with Medicaid.

Income. Missing income data were replaced by three methods: (1) logical imputation, (2) other imputation that was not hot decking, and (3) weighted sequential hot deck imputation (Iannacchione, 1982). Logical imputation was used when there were inconsistencies between the variables for the income amounts and the variables indicating income receipt at either the person or family level. For example, the variable indicating whether or not a person received income of a given type was sometimes missing even though the family indicator was coded to show no one having income of that type in the RU, and each person in the RU was coded as having a zero amount of the income. In such cases the missing values were logically imputed to "no" codes to indicate that the person did not receive any income of that type. For the three largest components of the income of Medicare beneficiaries and their family members, wages and salary, social security, and private pension income, income data were logically imputed for 4.78, 0.02, and 0 percent, respectively, of the sample persons who were living together in Round 4. For the remaining 23 income components, 99.19 percent of the sample had no more than one of these income measures logically imputed.

Some missing data were replaced using a method other than hot decking. For example, in some cases persons reported receiving a valid amount of income for a reporting period less than a year, but were missing data, for the number of periods during the year that the income was received. In these instances mean values of the duration of income receipt controlling for age and sex of the individual (to the extent that sample sizes allowed) were imputed to these individuals.

In the entire NMES household data base, only 113 persons reported receiving income from royalties, while only 51 persons reported receipt of any alimony income. Mean annual amounts of these income components were imputed to persons with missing royalty and alimony income data.

In some instances information was collected from an individual on the amount of income received, but data on the reporting period (e.g., monthly, quarterly, or annual) was missing. In these cases individual records for the person with the missing data and all their family members were examined to determine whether a reasonable accounting period could be selected. If not, the hot deck procedure discussed below was used to assign the individual a new income amount and duration of receipt.

A final example of this second method of imputation used employment and wage rate information from Round 1 of NMES to impute annual wage and salary data. If the Round 1 data showed that a person was employed yet their indicator for receipt of annual wage and salary income was coded as "missing" or "no", then this variable was coded as "yes" to indicate that the person was a recipient of wage and salary income. The hourly wage rate and hours per week variables from Round 1 were then used to impute an annual wage and salary amount for these persons. If the persons had reported receiving either tip, commission,or bonus income or self-employment income, then their annual wage and salary data were not imputed by this method.

For wages and salary, social security, and private pension income, 0.02, 0.67, and 0.78 percent of the Medicare beneficiaries and their family members, respectively, had data imputed by at least one of the procedures in the second category of imputation methods described above. For the remaining 23 income types, 99.8 percent of the sample had no more than one income component imputed by this method.

In the weighted sequential hot decks, the third imputation method listed above, missing values of income were replaced with observed values from NMES respondents who had valid income data and characteristics similar to those of the "recipient" group. Sample sizes for the Medicare beneficiary population and their family members were too small to run the hot decks for each of the 24 income sources, so the entire NMES household sample was used for the income imputation analysis. Initially regression equations were estimated to indicate which socioeconomic and demographic variables are most highly correlated with these 24 separate types of income.

Classification variables for the hot decks were selected for each income source that generally included no more than three variables from the following list: Medicaid coverage, Medicare coverage, private insurance coverage, gender, education, age, hourly wage rate, race/ethnicity, family size, marital status, homeownership, disability status, region, and occupation. Persons who had any income data for a given source imputed by the second method discussed above were omitted from the "donor group" for the hot decks.

Two hot decks were run for each of the 24 types of income. If a person reported that income of a given type had been received but the amount was missing, then the donor group for the hot deck contained only persons with nonzero amounts of that type of income. If data were missing on whether a person received the income, then the donor group contained persons with both zero and nonzero amounts of the income source.

In the NMES sample there were 83 persons who had missing data for the entire income supplement. These individuals were not included in the recipient groups for the initial hot decks for each source of income. They were, however, imputed annual income data for all sources in a single hot deck that included donors with complete income data even though some of it may have been imputed.

Among the Medicare eligibles and their family members who lived together in Round 4 of NMES, 6.68, 8.12, and 3.45 percent of the sample were imputed income amounts (zero or nonzero) by hotdecking for wages and salary, social security, and private pension income, respectively. For the remaining 21 income types, 87.32 percent of the sample had income imputed by this method for no more than one income source. None of the resulting Z-scores comparing donor and overall means per class for the total NMES population were significant which indicated that the means of the income distributions were not biased by this procedure for assigning missing values.

After imputing all income components, aggregate income measures were constructed for each Medicare beneficiary by summing over the 26 separate types of income reported on NMES. A similar family income measure was produced for each Medicare beneficiary by summing over the 26 types of income for each person in the beneficiary's family and then combining these amounts into a single family measure. The Medicare beneficiary's family income was then compared against the official poverty threshold for 1987 for the appropriate family size to

create the poverty status variable for the analysis. Estimates of person-level income and poverty counts from the 1987 NMES were validated with corresponding data from the March supplement to the 1988 Current Population Survey which collected annual person- and family-level income for 1987. The estimated poverty rate for Medicare beneficiaries 65 years and older in 1987 from NMES data is 11.8 percent, with a standard error of 0.8. Corresponding estimates from the Census Bureau for all persons 65 years and older in 1987 are a poverty rate of 12.2 percent, with a standard error of 0.4 (U.S. Bureau of the Census, 1988).

TECHNICAL APPENDIX E: VALIDITY OF NMES PRESCRIPTION DATA

TECHNICAL APPENDIX E: VALIDITY OF NMES PRESCRIPTION DATA

Like other data collected from household respondents, the data from the National Medical Expenditure Survey reported here are subject to error which may affect their validity. Nonresponse bias, sampling errors, measurement error and interviewer bias are among the factors that contribute to errors in surveys. One general model of survey error has been proposed by Anderson et al. (1979) based on the work of Kish (1965). The model classifies survey error as either variable error or bias and then further classifies both error and bias according to the source, sampling or nonsampling. Systematic error, or bias, is considered more detrimental to the quality of survey data than random error, since systematic errors affect any sample with the same constant error. Variable errors are assumed to be random with a mean of zero across replicate samples.

In surveys like NMES, nonsampling bias is often the largest contributor to total survey error. It is usually ignored, in part because nonsampling errors are difficult or impossible to measure. Nonsampling error includes nonobservation bias, defined as the bias associated with nonresponse, and observation bias, defined as the bias associated with data collection and post-survey data processing.

One means by which to assess the impact of these types of nonsampling bias is to compare household data to other sources of information, such as record data. The sources of error that affect household reports, such as the interviewer, the sensitivity of the questions, and the memory of respondents, is less likely to affect record data. The use of administrative records, either from health care providers or claims from insurers, has been one approach used in validating reports of health events reported in household surveys (e.g., Cannell, 1965; Marquis, 1980; and Madow, 1967). It should be noted that the assumption in all of these studies is that the difference between the two reports, the household interview data and the administrative record data, can be attributed to error in the household data.

This appendix will address the extent to which nonsampling error may have affected the NMES estimates of utilization and expenditures of prescription medicines by the Medicare population. The focus will be threefold: (1) examination of previous validation studies concerning the reporting of prescribed medicines; (2) a comparison of national estimates of purchases of

prescriptions from NMES and a commercial record data base; and (3) a comparison of reports for individuals in NMES with administrative records.

E.1 Previous Validation Studies of Prescription Medicines

Few studies have attempted to verify reports of prescription medicines by household respondents. One verification study, the 1975 Medical Economics Survey--Methods Study (MES) (Johns Hopkins Medical Institutions, 1977), was designed to evaluate several methodological questions related to the collection of medical utilization and expenditure data. Several of the study findings were used in designing the 1977 National Medical Care Expenditure Survey (NMCES), the 1980 National Medical Care Utilization and Expenditure Survey (NMCUES), and the current 1987 NMES, although it should be noted that the MES study did not address data from a national sample. Exhibits E-1 and E-2 contain two current evaluations of the Medical Economics Survey validation of prescription medicines and the applicability of its findings to NMES. The report presented in Exhibit E-1 was written by Stanley Presser, Ph.D., visiting professor of sociology and research fellow at the Survey Research Center, the University of Maryland. Dr. Presser is the author of several books and articles concerning survey methodology and response error, including Survey Research Methods, with Eleanor Singer (1989), Questions and Answers in Attitude Surveys, with Howard Schuman (1981), and Survey Questions, with Jean Converse (1986). The report provided in Exhibit E-2 was prepared by Barbara Bailar, Ph.D., executive director of the American Statistical Association and former associate director for statistical standards and methodology, U.S. Bureau of the Census.

Exhibit E-1. Evaluation by Stanley Presser

An Evaluation of the Medical Economics Survey-Methods Study (MESMS)

Stanley Presser, University of Maryland

The usefulness of the MESMS measurement error results for assessing the quality of data on prescribed drugs from the 1987 National Medical Expenditure Survey (NMES) is affected by two considerations. First, as in any methodological study, the MESMS error results are themselves subject to measurement error. The design of the MESMS and the practical difficulties encountered in its implementation may have affected the accuracy of its results. This is the problem of internal validity. Second, the MESMS methodological study was conducted with a different population than the one covered in NMES. Thus even if the MESMS conclusions were error-free, they might not generalize to other populations. This is the problem of external validity. Unfortunately there is no way to quantify the degree of either internal or external validity. All that can be done is to identify and roughly evaluate these potential sources of invalidity.

INTERNAL VALIDITY

Various factors affect the accuracy of the results from MESMS. Some of these factors lead to an underestimate of the measurement error in the household survey, some are apt to lead to an overestimate, and the effect of still another is uncertain. Even in cases where the direction of effect is clear, however, the magnitude of the effects is unknown.

Two factors most likely led to an underestimate of the error in the household reports. First, there were no provider verification data for roughly 20% of the cases (due to household nonresponse to the permission-form request and pharmacy nonresponse). In all these instances, the household report was accepted as accurate. The MESMS Final Report shows that verified cases were more discrepant from the "best data" than were unverified cases. But the Report includes no information about the characteristics of unverified cases, so it is impossible to know whether the accuracy of these cases is similar to those that were verified.

Second, the records of some pharmacists were probably organized solely by prescription number. In such cases, verification was not apt to uncover underreporting. Once again, however, it is not possible to estimate the magnitude of this effect, as the MESMS Report does not indicate what proportion of the pharmacists had records organized by patient's name.

Two other factors probably contributed to overestimating the error in the household reports. First, there was undoubtedly inaccuracy in the reports from the pharmacies caused by mistakes in the pharmacy records or errors in transcribing from the records to the survey forms. Second, error was most likely introduced in the matching of household reports to pharmacy reports. In neither instance is it possible to estimate the magnitude of these errors.

Finally, one feature of the study design probably caused an error of unknown direction in the estimates of household reporting accuracy. All dollar figures missing from the household survey

were imputed prior to matching. Thus some of the discrepancies between household and provider data sets are due to the imputation being wrong. Unfortunately, the Report indicates neither the proportion of values that were imputed nor the characteristics of cases requiring imputation.

EXTERNAL VALIDITY

The 1987 U.S. population covered by NMES differs in important ways from the 1975 Baltimore and Washington County, Maryland populations surveyed in MESMS. This could affect inferences from one study to the other if the characteristics on which the populations differed also were related to reporting accuracy.

Although half the MESMS sample was drawn from an area probability frame and half from health insurance records, the two halves were apparently weighted equally in the analysis. Thus MESMS overrepresents insured individuals. Since such individuals pay a smaller fraction of their medical expenses out-of-pocket they may be less apt to remember and report these expenses in an interview.

There is, in fact, limited indirect evidence from the MESMS Final Report that record sample households were more likely to depart from the "best data" on prescription drug use. In Baltimore, reports of both drug charges and utilization in HMO households (most, if not all, of whom presumably came from the record sample) were more discrepant from the "best data" than were non-HMO household reports. In Washington County, reports of drug utilization from households with private insurance were more at variance from the "best data" than the reports of households

without private insurance, though there was little difference for drug charges. Only a reanalysis of the MESMS data by source of sample could prove the point, but these results suggest that, ceteris paribus, the MESMS results probably overestimate the total measurement error for the U.S. household population.

Other things are rarely equal, of course, and the proportion of privately insured households is only one of numerous differences between the MESMS and NMES populations. The impact of these other differences is, however, difficult to gauge, as it is unclear how, if at all, other respondent characteristics are related to reporting accuracy. In MESMS, the relation of demographic characteristics to reporting accuracy was very different in Baltimore and Washington County. Thus extrapolating from the MESMS data to the U.S. population is hazardous.

These hazards are illustrated by trying to extrapolate from the MESMS Baltimore results to the MESMS Washington County results. Based on the finding in Baltimore that very low income households were particularly likely to yield data that departed from the "best data," one might assume that accuracy would be higher in Washington County than in Baltimore because Washington County has a much lower proportion of very low income households. In fact, accuracy <u>was</u> higher in Washington County. But it is unlikely this was due to differences in income because very low income households in Washington County were no more apt to provide inaccurate data than were that County's higher income households.

This result (as well as many others like it) suggests that the MESMS differences in accuracy between Baltimore and Washington

County were due to differences in how the MESMS was implemented in the two sites. In Baltimore, for instance, all the provider verification data were collected by mail or telephone, whereas in Washington County a considerable portion came from in-person visits, which may have yielded higher quality data.

CONCLUSION

There can be no doubt that the prescription drug estimates from NMES are affected by measurement error. But the MESMS results taken by themselves do not provide a firm basis for gauging the nature of this error.[1] Thus no figure in the MESMS Report (whether it be the 16% inaccuracy in drug utilization in Washington County or the 40% inaccuracy in drug charges in Baltimore) can be confidently generalized to NMES.

[1] The only prescription drug verification study other than MESMS that I know -- "Primary Levels of Underreporting Psychotropic Drug Use" by Hugh Parry, Mitchell Balter, and Ira Cisin, Public Opinion Quarterly vol. 34: 582-592 -- suffers from even more severe problems than MESMS.

Exhibit E-2. Evaluation by Barbara A. Bailar

REVIEW OF MEDICAL ECONOMICS SURVEY
METHODS STUDY

This report, Medical Economic Survey-Methods Study, issued in August, 1977, illustrates why the quality of a survey depends on the use to which it is put. A survey designed as a methodological study, as this was, can be extremely useful in evaluating methodologies such as telephone interviewing compared with in-person interviewing or monthly interviewing compared with bimonthly interviewing. Because treatments (type of methodology) are randomized over all eligible sample persons, one can compare the effect of treatments over similar populations. I think the study was very good for this purpose. However, as a study to provide estimates of the amount of response error in the utilization or charges for medical services as reported in household surveys, this study is poor. My reasons for saying this fall into seven main categories as follows:

1. There was a purposive selection of areas in which to do the survey, and the areas in no way represent anything but themselves.

2. The response rates to the survey itself and for households and necessarily for providers were poor.

3. There is wide variability in the estimated quality of the household data over the various methodologies, with no reason to select one estimate over another.

4. There are special problems with estimating the response errors in the utilization or charges for prescribed drugs that lead to an underestimate of the response errors.

5. Survey experience points to special problems for prescription drugs.

6. There are anomalies in the data that lead to questions about its accuracy.

7. The "best data set", though a useful concept, was none too good for prescribed drugs.

I shall describe each of these in turn.

1. Purposive selection of areas.

Because the purpose of the study was to evaluate alternative survey methodologies, a purposive selection of areas was made. The city of Baltimore and two surrounding counties were selected to represent an urban area with a large black population. Washington County was selected to represent a rural area. Each of these areas is close to Johns Hopkins personnel who conducted the study. Therefore, travel costs could be minimized and the bulk of the resources devoted to the comparison of methodologies. If the purpose of the study was to make national estimates of utilization, charges, or response errors in the household reporting, then the sample would necessarily have been spread over the United States, not concentrated in two sites in one state. There is no way any responsible statistician would be willing to make inferences about the total population from such a specialized sample.

2. Response rates.

For a methodological study, a comparison of response rates provides important information about the willingness of the population to respond to a certain way of collecting information. For a study in which the aim is to provide national estimates, response rates tell you whether or not you can have much confidence in your data. Efforts have to be made to boost response rates because it is usually the case that those who do not respond are different from those who do.

For this study, there were several levels of response. For the study of methodology, it was important to see if there was a difference in the initial nonresponse across methods. However, for a survey from which estimates of utilization, expenditures, and response errors are to be made, one must be concerned with response to the seven waves of the survey, to the authorization rate for permission to contact providers, and to the response rates of providers. This combination of response rates informs one of the quality of the resulting estimates. This survey, if it were to be used for estimation purposes, has very serious deficiencies. Table 1 shows the derivation of the best estimate I can make with the data available to me of the percent of persons who authorized the study staff to contact providers for utilization and expenditure data. Thus, one can see that over half of the eligible population in Baltimore and 30% of the eligible

Table 1. -- Number of Eligible Units, Response Rates, and Authorization Rates for Baltimore and Washington County

Location and procedure /1	Eligible housing units	Completed all interviews	Percent responding	Persons completing interviews	Percent giving authorization	Percent of all eligible
WC-MT	100	80	80.0	260	91.2	73.0
WC-BMT	101	78	77.2	274	88.7	68.5
WC-MIP	101	75	74.3	235	90.2	67.0
WC-BIP	109	85	78.0	272	89.7	70.0
WC-Total	411	318	77.3	1041	89.9	69.5
B-MT	157	96	61.1	344	79.4	48.5
B-BMT	158	103	65.2	328	76.8	50.1
B-MIP	159	79	49.7	258	81.4	40.4
B-BIP	150	97	64.7	329	85.7	55.4
B-Total	624	375	60.1	1259	80.8	48.6

/1 WC stands for Washington County and B stands for Baltimore. MT is monthly telephone, BMT is bimonthly telephone, MIP is monthly in-person, and BIP is bimonthly in-person.

population in Washington County are not even represented in the group of people who authorized the record check. These numbers must be multiplied by the response rate for pharmacies. So, for Baltimore, the percent of all eligible forms with prescription numbers on them that could have been sent for a record check if the number of forms for the people who dropped out of the survey or refused

authorization were the same as those who responded and authorized contact was 46.2%. In Washington County, it was 66.9%. These are very low percentages on which to base any policy decisions. As a contrast, the Health Interview Survey routinely gets response rates of over 90.0%.

3. Special problems with pharmacies.

There are special problems with the use of data collected from pharmacies to give estimates about the accuracy of the data. First, the form that was sent to pharmacies, the ME40 shown on page VI-26 of the report, shows that the household respondent had to list all the prescription numbers of drugs prescribed by a physician. Pharmacies have their files arranged by prescription number and not by name. Therefore, the respondents were asked to do a substantially larger task for prescription drugs than for other services. They had to find each prescribed drug and give the prescription number. This is the kind of reporting that respondents do not do well. Many do not want to make the effort to find the drugs and many forget to include all prescribed drugs.

Respondents also had to remember all the pharmacies that they might have visited. It is quite common for people to frequent pharmacies close to their employment as much as those close to their homes. They also use "all-night drug stores." Therefore, it is much more likely that there is underreporting of pharmacies than of hospitals or doctors.

Finally, there is another problem related to the use of prescription numbers and that is the transposition of numbers, either by the respondent or the interviewer. When a transposed number would reach the pharmacy, the pharmacist might know not to report the information for a person not named on the front of the form, but there is no instruction not to do so. Also, the pharmacist will not try to change the numbers around to find the right composition. This is not such a problem when the names of patients are used.

The combined effect of these factors is to underestimate the number of pharmacies and the number of prescribed drugs. The effect on the underreporting of utilization and expenditure data is undoubtedly substantial. There are already substantial problems with prescribed drugs. The tables in the report show that the accuracy of reporting, even for those cases reported by respondents, was among the lowest of all medical services. Given the special problems of pharmacies, these estimates are probably too high.

4. Variability of results by treatment.

Household reporting in this study was very dependent on the interviewing methodology. There seemed to be little consistency among the methods. A comparison of Tables 13 and 20 on pages 56 and 63, respectively, of the study report, shows how dangerous it is to use one number for either of the areas. These tables show a two-way comparison of "% Best-Verified Data" measures among household strategies for utilization and charges by type of service. Table 2 shows the variability of these ratios by procedure. There is real disparity among the treatments, especially in Baltimore. The bi-monthly telephone treatment is much lower, both for utilization and charges, than the other three treatments.

In fact, this table raises many questions that one should try to resolve before using the data for any other purpose. For example, why would monthly in-person interviews result in better data in Baltimore on charges than in Washington County? More likely this is an artifact of using the prescription numbers and getting fewer pharmacies than one should. However, if that is the case, then why do the bi-monthly in-person interviews give almost identical results for Baltimore and Washington County for expenditures?

Table 2 -- Percents of Household Data to Best-Verified Data for Utilization and Charges by Procedure and Site

	Site			
	Baltimore		Washington County	
Procedure	Utilization	Charges	Utilization	Charges
Monthly telephone	62.5	84.2	83.2	88.4
Bi-monthly telephone	50.0	70.6	77.4	86.8
Overall telephone	56.1	78.3	78.6	87.7
Monthly in-person	62.6	88.1	69.2	80.6
Bi-monthly in-person	69.2	79.5	72.8	79.6
Overall in-person	65.3	84.0	71.1	80.1
Overall monthly	62.5	85.9	76.0	84.6
Overall bi-monthly	58.8	74.8	73.7	82.9

5. Anomalies in the data.

The data on wide variation of estimates by type of treatment referred to in section 4 are anomalies, but the anomalies I refer to in this section are related to the population variables described in Appendix V of the report.

One anomaly is the estimated accuracy by type of respondent. One would expect to see some consistency in the numbers for one-person households and self-respondents, since one-person households are, by necessity, self-respondents. The tables on page V-6 and on page V-35, for Baltimore and Washington County respectively, illustrate odd results. The estimates are not close to each other and bounce around over the categories. There is also another peculiarity. The proxy respondent-child category has the lowest per person charges, but the highest percent of best data. Proxy respondents who have to furnish prescription numbers are unlikely to be able to do it. The tables refer separately to proxy respondents for adults and for children. As might be expected, proxies for children, since they are likely to be paying for these prescriptions, remember these cases better than proxies reporting for adults. It is somewhat discouraging to see that almost one third of the sample in both Baltimore and Washington County were responded to by proxies.

For prescription drugs, when respondents are asked for prescription numbers as the basis for a recheck, and when respondents must remember all the pharmacies at which prescriptions might have been filled, proxy respondents clearly pose problems. It is unlikely that proxy respondents--for adults or children--would know the names and locations of all relevant pharmacies or the prescription numbers of all relevant drugs. Yet 59% of the Baltimore sample and 61% of the Washington County respondents were proxies.

Other anomalies appear when ratios of household reports to best data are compared by age, and by income. The very poorest households, those with incomes under $5,000 per year, appear to be poor reporters. This is not a surprising outcome, but what is surprising is the variability in response over the methods. Telephone methods look very poor, as do bi-monthly interviews. Data from other sources show that telephone ownership is very low for this group. It may be that the group of people in this income category who do have telephones are quite different from the rest of the population.

6. Survey experience.

There are facts known about motivating respondents and knowledge is emerging about respondents' reactions to surveys. The study directors seemed quite aware of these factors for conducting a methodology study. They incorporated a shorter recall period than is generally used in surveys, though longer than that used in the Health Interview Survey, recognizing the limitations of longer recall periods. Yet even these shorter periods are too long for events that are not particularly salient to respondents. Filling prescriptions is not a good candidate for recall in the lives of busy, working people. It may take on more saliency for older people, but not if they are busy or not if they are forgetful.

Tables on page V-32, V-33, V-56, and V-57 seemed to give peculiar results. One would expect better reporting of higher expenditures, just because spending more money would tend to make the events more memorable. Yet the reporting levels for higher expenditures do not seem to be much better reported than the levels for low expenditures. Also, the estimates of per person charges did not follow a consistent pattern of rising estimates for increasingly higher medical expenditures. For example, in Baltimore, the per person charges for the $300-499 medical expenditure category dropped below those for the $200-299 category. Similar things occurred for the Washington County respondents. In both sites, the estimates for the two groups with medical expenditures between $500-2,000 seem depressed. It may be with higher expenditures that the respondents were less motivated to remember, look for, and list each prescription.

7. Best Data Set has deficiencies.

The concept of a "best data set" is a good one. It promotes the idea of having a better figure on expenditures and utilizations against which to compare household reporting. However, the best data set as derived is not the same as the concept. It does not take into account underreporting of events such as prescription numbers. It would be very useful to see the codes for the best data set. How many of the records in the set were HP records only, HT records only, and how many had all three sources--households, providers, and third party payers? How much of the data agreed on dates within short time periods? How much agreed within small dollar variations? The coding scheme as spelled out in Appendix VIII is very complex. To fully understand whether the best date set was good, one would need to know how much of it was classified by the different codes. Even with this knowledge, the amount of underreporting of pharmacies and of prescription numbers would not be available.

E.2 Comparison of NMES Estimates of Utilization and Charges with Other Sources

To assess the validity of the NMES data, estimates of utilization from NMES were compared to estimates from Pharmaceutical Data Services (PDS), Inc. and IMS America, Ltd.. Both PDS and IMS collect purchasing data directly from pharmacies, thereby eliminating some of the sources of error associated with household interview data (for example, interviewer error or respondent recall error).

The estimates from PDS-ALPHA Data Services Division, a division of PCS, Inc. is based on 400 million prescriptions dispensed from more than 12,5000 pharmacies nationwide through a computerized pharmacy terminal database. PDS provided data not only on the national estimates of utilization, but also the utilization and expenditures associated with the generic ingredient for single-source, i.e., non-compound, prescriptions. The second estimate, based on the National Prescription Audit (NPA) conducted by IMS America, Ltd., was reported in Pharmacy Times (April 1988). The NPA is based on 36 million prescriptions filled in approximately 2000 retail pharmacies. Both the PDS and NPA samples are designed to represent the U.S. population and each weights their respective data to yield national projections of sales.

In comparing estimates from NMES and these two pharmaceutical industry data bases, it should be remembered that PDS and NPA data are based on the number of prescriptions dispensed in commercial pharmacies, whereas the NMES Household Survey focuses on the number of prescriptions purchased or obtained by the noninstitutionalized civilian population only. To the extent that PDS and NPA estimates include purchases by either institutionalized or noncivilian individuals, their estimates will be higher than those generated from NMES. Nonetheless, all three data sources provide national estimates.

E.2.1 National Estimates of Utilization

The PDS estimate of total prescriptions dispensed in 1987 is 1.51 billion, as compared to an 1.58 billion NPA estimate. This compares to a NMES estimate of 1.24 billion. Assuming that the difference between NMES and either PDS or NPA is completely attributable to error in the household interview, this comparison suggests an overall underreporting rate in NMES of approximately 20 percent. However, it should be noted that all three types of estimates presented

here (from NMES, PDS, and IMS), are subject to sampling error and to measurement error; therefore, when standard errors are taken into account the difference between NMES and either PDS or IMS may actually be less than or greater than 20 percent.

Of primary concern for the present report is whether the 20 percent underestimate implied by the overall comparison is in fact applicable to the reporting of prescriptions by Medicare beneficiaries. Data from PDS or NPA were not available for specific ages or other population subgroups. In order to direct the analysis to this population subgroup, we assessed the impact of the overall underreporting rate by evaluating rates of utilization from NMES and PDS for specific prescription medicines for the total population and for the Medicare population.

Utilization rates by generic ingredient indicate that differences in reporting between NMES and PDS data are not constant across prescriptions; nor are all prescriptions underreported in NMES as compared to PDS. Table E-1 lists the 20 most frequently purchased prescriptions, according to PDS data, classified by generic ingredient.[1] Column 2 of Table E-1 presents the ratio of utilization by the total civilian, noninstitutionalized U.S. population as estimated in NMES to the total utilization as estimated by PDS. As noted above, each of these estimates is subject to sampling errors which affect the precision of the ratios. Standard errors were not available for the PDS data.

The ratios differ considerably according to generic ingredient, indicating both under- and over-reporting. For example, the NMES estimate of the total volume of generic furosemide prescriptions is 21.1 million, which compares to 22.2 million for PDS, or a ratio of .95. The ratio of the difference for several other generic ingredients, specifically ibuprofen, digoxin, propanolol, theophylline, nitroglycerin, and dipyridamole is likewise within 10 percent for the two sources. The ratios for amoxicillin, erythromycin, penicillin V, and diazepam (tranquilizers) are quite low, while the ratio for insulin, 1.71, would indicate that insulin is overreported in NMES by 70 percent. However, as insulin is not considered a prescription medication in any state, estimates from PDS, which monitors prescription sales, would be expected to be low as compared to NMES.[2] In all, if

---

[1]The list of generic ingredients was provided to PDS by NCHSR and is based on the list developed by NCHS for the National Ambulatory Medical Care Survey. See Appendix C for details. No comparison was made for norethindrone (birth control pills) since NMES data classify birth control pills as a compound substance rather than a single ingredient prescription.

[2]Insulin is included in this report because the Medicare Catastrophic Act legislation includes insulin as a covered outpatient prescription drug.

Table E-1. Comparative utilization rates for NMES and PDS: 20 most frequently purchased generic ingredients

Generic ingredient	NMES: PDS ratio[a]	Percent obtained by Medicare beneficiaries[b]
Amoxicillin	.70	3.8
Erythromycin	.54	11.2
Norethindrone	–	–
Ibuprofen	.93	32.1
Penicillin V	.69	8.8
Furosemide	.95	72.0
Digoxin	1.07	80.6
Propanolol	1.07	49.5
Theophylline	.96	46.5
Estrogens	.85	18.2
Nitroglycerin	.98	67.3
Diazepam	.54	39.3
Alprazolam	.88	36.8
Hydrochlorothiazide	1.18	49.9
Levothyroxine Sodium	.82	35.2
Cimetidine	.89	42.8
Dipyridamole	1.09	71.3
Albuterol	.85	36.2
Naproxen	.80	33.7
Insulin	1.71[c]	52.2

[a]Ratios based on national estimates of utilization for the U.S. population. Ratio = NMES estimate/PDS estimate.

[b]Based on NMES estimates.

[c]Insulin is not a prescription medicine.

Source: National Center for Health Services Research and Health Care Technology Assessment, National Medical Expenditure Survey and PDS-Alpha Data Services

ratios under 1.00 are considered underreporting in NMES and those above 1.00 as overreporting in NMES, then 10 of the generic ingredients are underreported and 2 are overreported by more than 10 percent.

More to the point is the extent to which these differences between survey and record data affect the prescription expenditures of the Medicare population, which has a disproportionately high use of medications relative to its size, accounting for 33 percent of all prescriptions according to NMES estimates. Column 3 of Table E-1 indicates the percentage of each generic ingredient purchased or obtained by Medicare enrollees relative to the total population according to NMES data. With the exception of diazepam, the prescriptions with the lowest NMES/PDS ratios relate to prescriptions least likely to be purchased by Medicare enrollees. For example, only 3.8 percent of all amoxicillin (an antibiotic) is purchased by Medicare enrollees. The Medicare population constitutes approximately 13 percent of the population; estimates in column 3 that are less than 13 percent of total use would indicate that the particular medication is not one frequently used by the Medicare population. By contrast, percentages in excess of 13 percent indicate that the Medicare population accounts for a relatively large share of the total use of the respective medication. Thus, 80.6 percent of digoxin prescriptions are purchased by Medicare enrollees; according to the ratio of NMES to PDS data (1.07), it appears that digoxin is slightly overreported in NMES. Prescriptions for which Medicare enrollees are the major purchasers generally are also those for which the two sets of estimates are most similar.

Three conclusions can be drawn from Table E-1. It is clear from the table that the ratios vary according to the type of prescription ingredient, ranging from a low of .54 for erythromycin and diazepam to a high, excluding insulin, of 1.18 for hydrochlorothiazide. NMES estimates of prescriptions which are disproportionately more likely to be purchased by Medicare enrollees, as compared to the total population, are in fact generally similar to the estimates from PDS. Consequently, there appears to be no consistent underreporting of prescriptions for the Medicare population.

E.2.2 Prescriptions Most Frequently Purchased by Medicare Enrollees

To focus this comparison of record and survey data, Table E-2 presents the comparative utilization rates for the 20 most frequently purchased prescriptions by Medicare enrollees. The table is organized similarly to Table E-1: Column 2 presents the ratio of NMES to PDS estimates for utilization; column 3 indicates the NMES estimate of the percent of the generic ingredient purchased or obtained by Medicare enrollees. The estimates of utilization are again for the entire U.S. population to account for the lack of age-specific PDS data. The ranking of prescriptions by frequency of use is based on NMES data; it should be noted that it parallels the National Disease and Therapeutic Index (NDTI) of the top medications among the elderly (Baum et al., 1987), which is derived from information reported by a panel of office-based physicians. (NDTI estimates represent medications prescribed, recommended or given in a medical setting but do not imply purchasing or compliance.) These generic ingredients account for almost 40 percent of all prescriptions purchased by Medicare enrollees according to NMES data.

The range of the ratios presented in Table E-2 is much smaller than in Table E-1; thus the primary prescriptions purchased by Medicare enrollees are subject to smaller levels of under- or over-reporting than prescriptions in general. The difference between the NMES and PDS estimates is 10 percent or less for 12 of the 19 (63 percent) of the prescriptions.[3] Of the 19 generic classifications that could be compared between NMES and PDS, 8 are underreported in NMES (ratio less than 1.0) while 11 appear to be overreported (ratio greater than 1.0).

The findings in Table E-2 suggest, therefore, that to infer an overall underreporting rate of 20 percent to NMES reports of prescription medicines by Medicare enrollees would be misleading. There is no consistent trend of either under- or overreporting of these generic ingredients. Although the comparisons of utilization are for the entire population, it is clear that the prescriptions most frequently purchased by Medicare enrollees are relatively well reported when compared to PDS estimates, the precision of which is assumed here for the sake of comparison.

---

[3] No ratio was calculated for potassium due to differences in classification of potassium replacement prescriptions for NMES and PDS.

Table E-2. Comparative utilization rates for NMES and PDS: 20 most frequently purchased generic ingredients among Medicare beneficiaries

Generic ingredient	NMES: PDS ratio[a]	Percent obtained by Medicare beneficiaries[b]
Digoxin	1.07	80.6
Potassium	–	61.4
Furosemide	.95	72.0
Insulin	1.71[c]	52.2
Nitroglycerin	.98	67.3
Dipyridamole	1.09	71.3
Propranolol	1.07	49.5
Hydrochlorothiazide	1.18	49.9
Isosorbide	1.16	75.8
Theophylline	.96	46.5
Ibuprofen	.93	32.1
Nifedipine	1.09	63.4
Diltiazem	.93	62.8
Captopril	1.04	58.5
Atenolol	1.22	35.0
Cimetidine	.89	42.8
Methyldopa	1.05	62.7
Metoprolol	1.05	49.6
Rantidine	.83	40.6
Albuterol	.85	36.2

[a]Ratios based on national estimates of utilization for the U.S. population. Ratio = NMES estimate/PDS estimate.

[b]Based on NMES estimates.

[c]Insulin is not a prescription medicine.

Source: National Center for Health Services Research and Health Care Technology Assessment, National Medical Expenditure Survey and PDS-Alpha Data Services

E.2.3 Comparative Estimates of Charges

At the time this report was written (Spring 1989), charges for prescriptions reported in NMES were only available for medications purchased by Medicare beneficiaries. To the extent that the proportion of generic prescriptions purchased in outpatient pharmacies or ordered by mail by Medicare beneficiaries differs from that of the total population, the average charge per prescription will differ. However, it is still useful to compare the NMES charges per prescription for medications purchased by Medicare beneficiaries with the charges associated with a prescription for the total population.

Table E-3 presents the ratio of the NMES charge per prescription to the PDS charge per prescription for the 20 most frequently purchased medications among Medicare beneficiaries, as presented in Table E-2. Similar to utilization ratios, there is no evidence of charges in NMES being consistently lower or higher than those reported by PDS. For 10 of the 19 generic ingredients, the NMES charge was lower than the PDS charge, and for 9 of the generic ingredients the NMES charge exceeded the PDS estimate. For 13 of the 19 prescriptions, or 68 percent, the two estimates were within 10 percent. The most discrepant charges were associated with hydrochlorothiazide, for which the NMES estimate was $6.49 as compared to $4.24 by PDS. If the charges for all purchases by Medicare beneficiaries of hydrocholothiazide in the NMES data base were reduced to $4.24, the reduction in total expenditures by Medicare beneficiaries would be approximately 0.5 percent, or $45 million.

E.3 Comparison with Claims Data

To assess the level of error at the individual level, two sources of prescription claims were obtained for a portion of NMES respondents. Medstat claims, consisting of state Medicaid claims for 14 states, were provided by the Health Care Financing Administration for approximately 900 NMES respondents. Similarly, PCS provided claims data for approximately 1,400 NMES respondents. However, problems in data processing of these files has not permitted completion of this analysis at this time.

In conclusion, the foregoing comparisons of household survey data from NMES with a record-based data source revealed no consistent trends of differences. In particular, taking into

Table E-3. Comparative charges per prescription for NMES and PDS: 20 most frequently purchased generic ingredients among Medicare beneficiaries

Generic ingredient	NMES: PDS ratio[a]	Percent obtained by Medicare beneficiaries[b]
Digoxin	1.25	80.6
Potassium	–	61.4
Furosemide	1.21	72.0
Insulin	.61	52.2
Nitroglycerin	.97	67.3
Dipyridamole	1.04	71.3
Propranolol	.94	49.5
Hydrochlorothiazide	1.53	49.9
Isosorbide	1.17	75.8
Theophylline	1.02	46.5
Ibuprofen	1.17	32.1
Nifedipine	.91	63.4
Diltiazem	.95	62.8
Captopril	.98	58.5
Atenolol	1.06	35.0
Cimetidine	.97	42.8
Methyldopa	1.03	62.7
Metoprolol	.94	49.6
Rantidine	.90	40.6
Albuterol	.96	36.2

[a]Ratios based on national estimates of utilization for the U.S. population. Ratio = NMES estimate / PDS estimate.

[b]Based on NMES estimates.

[c]Insulin is not a prescription medicine.

Source: National Center for Health Services Research and Health Care Technology Assessment, National Medical Expenditure Survey and PDS-Alpha Data Services

account the medications that constitute the majority of prescriptions for the Medicare population, estimates from a data base relying on prescriptions filled in commercial pharmacies seem generally similar. More definitive conclusions must wait for a comparison of standard error estimates, and comparable population estimates, and for a more detailed examination of the types of error inherent in the various types of data bases considered. Neither is possible on the basis of available data.

TECHNICAL APPENDIX F:
EFFECTS OF PART-YEAR RESPONSE

TECHNICAL APPENDIX F: EFFECTS OF PART-YEAR RESPONSE

Panel surveys interviewing respondents several times over a specified period (twelve calendar months in four rounds in NMES) tend to lose sample participants because persons who participated in the initial interview fail to respond in one or more of the subsequent interview rounds. Known as sample attrition, this loss of survey participants may be due to their refusal to continue to cooperate or to the inability of the data collector to locate respondents who move between interviews.

In NMES, this type of sample attrition was approximately 6 percent, that is, a relatively low rate. Thus, it was possible to treat as complete nonrespondents all those survey participants who did not report for the entire period for which they were eligible, limiting the estimates in this report to data obtained from those individuals with complete data. This includes both those respondents who reported for the entire year as well as those who reported data for the entire period of their eligibility. In the case of the NMES Household Survey, eligibility extended to the time at which respondents left the civilian noninstitutionalized population, whether due to death or institutionalization, or because they moved outside the territory of the United States.

There are advantages and disadvantages to the approach used. Eliminating part-year respondents from the analysis results in a more easily understood distribution of utilization and expenditures. For if part-year respondents are included in the analyses, a weight that adjusts for the period of time for which the respondent reported must be used for estimation, and a time-adjusted weight may result in fractional utilization estimates. Similarly, utilization and expenditure estimates must be inflated to reflect the entire calendar year 1987. For example, if part-year respondents reported data for the period from January 1 through June 30, all of their utilization and expenditure data would have to be inflated by a factor of two. This inflation results in an overestimation of the number of people with no utilization or expenditures and an underestimation of the number of people with only a single event.

By contrast, treating part-year respondents as nonrespondents makes it possible to adjust for the loss of response by the use of weights (see Appendix G for a discussion of sampling and adjustment weights). This adjustment in the weights is designed to control for potential differences in the age, race, and gender composition between part-year and full-year respondents,

thereby reducing bias from nonresponse. The disadvantage of this approach is that the adjustment does not correct for potential dissimilarities in other demographic characteristics, nor in rates of utilization and expenditures. Moreover, treating part-year respondents as nonrespondents results in discarding utilization and expenditure information for the portion of the year for which data are, in fact, available, thereby risking an increase in the variance of the estimates.

This appendix will examine the potential bias associated with treating part-year respondents as nonrespondents. To the extent that the part-year respondents can be shown to differ from the full-year respondents, estimates based only on full-year respondents may be biased.

F.1 Estimation Strategies for Part-Year Respondents

Due to the complex design of NMES, it is inappropriate to compare unweighted estimates of person-level characteristics for full-year and part-year respondents. Time-adjusted weights were developed to permit comparisons of these two populations. As noted above, estimates of utilization for part-year respondents must be inflated to represent calendar year 1987. The methodology for each of these components that is necessary for estimation is outlined below.

Time Adjusted Weights. A person level sampling weight was constructed to allow for the inclusion of part-year NMES respondents in the derivation of national utilization and expenditure estimates. More specifically, each Round 1 respondent's period of eligibility (as a member of the civilian noninstitutionalized population) in 1987 was determined. All individuals who responded in NMES for at least one-third of their eligibility period were considered to be respondents. A nonresponse and poststratification adjustment was made to the person level sampling weights that adjusted for the nonresponse of individuals who did not respond for at least one-third of their period of eligibility. The Round 1 person level weights, WTPER(i), for the individuals who responded for at least one-third of their period of eligibility were poststratified to March 1987 CPS population totals within weighting classes defined by a cross-classification of age, gender, and race/ethnicity (considering the same categories used in the development of full-year NMES respondent weights).

More specifically, the nonresponse and poststratification adjustment for the cth weighting class took the form:

$$F(c) = \frac{CPSPER(c)}{\sum_{i \xi rc} WTPER(i)}$$

where $i \xi$ rc are respondents in c

where CPSPER(c) reflects the March 1987 CPS estimate of persons defined by the cth weighting class, which reflects a cross-classification of age-gender and race/ethnicity. Consequently, the nonresponse adjusted poststratified weight for the ith respondent in weighting class c took the form:

$$W(i) = F(c) \times WTPER(i)$$

where WTPER(i) is the Round 1 person-level weight.

Time Adjusted Utilization Rates. In addition, a time adjustment factor was derived for all individuals who responded for at least one-third of their period of eligibility. The underlying assumption in using this inflation factor is that the rate of utilization and expenditures for the nonresponding period will be identical to the responding period. The time adjustment factor took the form

$$TI(i) = ED(i)/RD(i)$$

where ED(i) is the number of eligibility days for sample person i to respond in NMES over the course of 1987,

and RD(i) is the number of days sample person i has responded over the course of 1987.

Mean estimates of prescribed medicine usage under this estimation strategy would be derived as follows:

$$Y = \frac{W(i)\, TI(i)\, Y(i)}{W(i)}$$

where Y(i) is the number of prescribed medicines person i reported using during the responding period over the course of 1987, and W(i) is the person level weight for individuals who have responded for at least one-third of their period of eligibility.

Here, only those individuals who have responded for at least one-third of their period of eligibility are included in the analyses as part-year respondents.

F.2 Demographic Characteristics

The demographic characteristics presented in Table F-1 compare the characteristics of the full-year respondents, adjusted for nonresponse, with those of part-year respondents. The weights used in producing the estimates for the full-year respondents adjust for the nonresponse attributable to the part-year respondents. To the extent that there are no significant differences between the two groups, the weighting adjustment serves as an appropriate adjustment for part-year nonresponse. However, as noted in Appendix G, age, race, and gender were the only measures used to adjust person-level weights. Therefore, differences among other characteristics not controlled for in the adjustment may be evident.

To test the equality of the two distributions, an approximation to the Chi-square statistic was calculated. Although a Chi-square test is a logical choice for making inferences about the differences in the distributions for the two groups, the value of a Chi-square statistic varies directly with the sample size when the sample proportions stay constant. Large values of the Chi-square statistic lead to rejection of the null hypothesis that the two groups are the same; it would therefore not be difficult to reject all such hypotheses with samples over 500,000 for each of these groups. Comparisons of percentages using a Z-statistic are less affected by sample size. Since a Chi-square distribution can also be interpreted as a sum of a number of squared standardized

Table F-1. Distribution of demographic characteristics of NMES Medicare beneficiary respondents[a]

	Full-year respondents (percent)	Part-year respondents (percent)
Age in Years		
Less than 65	13.8	11.1
65-74	52.8	48.3
75-84	26.5	27.4
85 or older	6.9	13.1
Gender		
Male	42.7	38.0
Female	57.3	62.0
Ethnic/Racial Background		
White	87.6	85.4
Black	9.2	7.4
Hispanic	3.3	6.8
Education		
Less than 12 years	48.7	51.3
12 years	30.3	29.3
13 years or more	21.0	19.4
Private Health Insurance Status		
Any private	72.6	74.8
Public only	27.5	25.2
Region[b]		
Northeast	21.9	33.1
North Central	25.1	30.1
South	35.2	22.0
West	17.8	14.7

[a]Distributions weighted to reflect national estimates. See text for discussion of weights. Unweighted N for full-year respondents equals 6,038; for part-year, 151.

[b]Distribution by region is significantly different, $\chi^2 = 24.9$, $p < .01$.

Source: National Center for Health Services Research and Health Care Technology Assessment, National Medical Expenditure Survey

normal variables (Blalock, 1979), Z-scores for k-1 pairs within a demographic characteristic were calculated, squared, and then summed to approximate the Chi-square distribution. More specifically,

$$\chi^2 = \sum_{k=1}^{k-1} Z_i^2 = \sum_{k=1}^{k-1} \left[\frac{p_{i1} - p_{i2}}{\sqrt{\frac{p_{i1}q_{i1}}{N_1} + \frac{p_{i1}q_{i2}}{N_2}}} \right]^2$$

where p_{i1} is the proportion of the full-year respondents for the ith category, where partial nonresponse is treated as complete nonresponse;

p_{i2} is the proportion of the part-year respondents for the ith category;

q_{i1} is equal to $1 - p_{i1}$; and

q_{i2} is equal to $1 - p_{i2}$.

The resulting statistic is Chi-square distributed, has k-1 degrees of freedom and is less affected by sample size than the Chi-square statistics calculated from the difference of observed and expected values.

The only demographic characteristic for which the distributions differ significantly is region. Persons living in the Northeastern region were less likely to participate for the full period for which they were eligible than individuals from other regions, most notable the South. To the extent that prescription utilization differs by region, this difference may affect overall utilization estimates.

Utilization rates for the two groups are presented in Table F-2. The comparison of the mean number of prescriptions per beneficiary and the mean number of prescriptions per beneficiary with at least one prescription indicates that there is no difference between the two groups. The estimate of the number of persons with no prescriptions in 1987 is higher for the part-year respondents than for the full-year respondents, a finding not unexpected, given the methodology used to estimate the annual rates for the part-year respondents. Estimates of mean utilization rates based on the combined groups (and using a time-adjusted weight for all

Table F-2. Annual utilization of prescribed medicines by NMES Medicare beneficiary respondents[a]

	Full-year respondents	Part-year respondents
Mean number of prescriptions per beneficiary	15.3 (.317)	14.3 (1.41)
Mean number of prescriptions per beneficiary with at least one prescription	18.7 (.368)	19.9 (1.70)
Percent of beneficiaries		
Without prescriptions	18.0	28.4
1-4 prescriptions	17.8	8.7
5-9 prescriptions	14.6	15.2
10-20 prescriptions	22.4	21.6
21+ prescriptions	27.2	26.2

[a]Distributions weighted to reflect national estimates. See text for discussion of weights. Unweighted N for full-year respondents equals 6,038; for part-year, 151. Numbers in parentheses are standard errors.

Source: National Center for Health Services Research and Health Care Technology Assessment, National Medical Expenditure Survey

respondents) are identical to the estimates based only on the full-year respondents (15.3 prescriptions per person); the proportion of beneficiaries with no prescriptions is likewise not statistically different (18.2 percent as compared to the 18.0 percent reported in the table).

The findings indicate that although there is some difference in the geographical distribution of the full-year and part-year respondents, treating the part-year respondents as nonrespondents and adjusting the weights for the full-year respondents introduces no bias in the utilization estimates for the entire Medicare population.

TECHNICAL APPENDIX G: WEIGHTS AND VARIANCE ESTIMATION PROCEDURES FOR THE USE OF PRESCRIBED MEDICINES, NMES HOUSEHOLD SURVEY, 1987

TECHNICAL APPENDIX G: WEIGHTS AND VARIANCE ESTIMATION PROCEDURES FOR THE USE OF PRESCRIBED MEDICINES, NMES HOUSEHOLD SURVEY, 1987

G.1 Derivation of Sampling Weights and Response Adjustments

The Household Component of the National Medical Expenditure Survey (NMES) was designed to provide statistically unbiased national estimates of health care parameters that are representative of the U.S. civilian noninstitutionalized population. The sample can be characterized as a stratified multistage probability design which combines two independently selected national samples from two separate data collection organizations, Westat, Inc. and NORC. Due to the complex survey design, the sample data must be appropriately weighted to obtain accurate estimates for the U.S. civilian noninstitutionalized population.

The sampling weights that were developed for this purpose reflect the complex survey design of the NMES. Separate weights have been developed to accommodate NMES prescribed medicine analyses at the person and event levels. The sampling weights include adjustments for:

(1) The **complete nonresponse** of eligible sample units;

(2) **Partial response** of survey participants providing data for only a portion of the time in 1987 during which they were eligible to respond;

(3) **Poststratification** to more accurate population totals obtained from the Census Bureau's Current Population Survey.

Due to the time constraints associated with the NMES report to Congress, the sampling weights developed for the prescribed medicine analyses were derived from the NMES sampling weights developed for use with NMES Round One data. Consequently, the potentially eligible population for the prescribed medicine analyses consisted of respondents to the Round One interview, excluding the following additions to the NMES sample over the course of 1987:

- New births
- Individuals returning to sampled households that were not eligible for sample selection during the Round One interview period (e.g., active duty military in Round One returning to civilian status, individuals living outside the U.S. in Round One who return to sample households, and individuals institutionalized in Round One returning to sampled households)

Since the eligible population for the prescribed medicine analyses thus represents the U.S. civilian noninstitutionalized population in the first quarter of 1987, the poststratification adjustments considered CPS population totals for March, 1987 (Source: U.S. Bureau of the Census, March 1987 Current Population Survey).

G.1.2 Sampling Weight Specifications

Dwelling Unit Sampling Weights

Both person and event level prescribed medicine weights were derived from sampling weights developed at the dwelling unit level. Dwelling Units (DUs) consisted of housing units, group quarters, and other noninstitutional (non-group) living quarters. All noninstitutionalized civilians who considered the sampled dwelling unit as their usual place of residence were included in the interview. The initial unadjusted sampling weight for each sampled dwelling unit was defined as the reciprocal of the sample unit's selection probability. These weights act as inflation factors to represent the number of units in the survey population that are accounted for by the sample unit to which the weight is assigned.

As nonresponse is widely viewed as a potentially important source of error or bias in survey estimates, the DU sampling weights were adjusted to accommodate nonresponse. By implicitly attributing to nonresponding sampling units the same characteristics of similar respondents within the same adjustment (weighting) class, resulting nonresponse adjustments have the capacity to reduce the degree of nonresponse bias in final estimates. Adjustment classes for entire DU nonresponse to the NMES Round One interview were defined based on cross-classifications of the following measures:

(1) Relative Health Care Expenditures of the Standard Metropolitan Statistical Area (SMSA):

   (a) Primary Sampling Units (PSUs) with relatively high health care costs;

   (b) PSUs with relatively low health care costs;

   (c) Remainder of certainty PSUs (a primary sampling unit selected with a probability of one from its respective sampling stratum);

   (d) Remainder of non-certainty SMSA PSUs; and

   (e) Noncertainty non-SMSA PSUs.

The classifications were based on a health care index produced by the Bureau of Labor Statistics for 26 selected SMSAs from the Consumer Expenditure Survey (Source: U.S. Bureau of Labor Statistics, 1982-1983 Consumer Expenditure Survey).

(2) Racial/ethnic character of the sample segment containing the DU (Hispanic, Black--not Hispanic, Other).

For the Westat sample, each segment was classified based on 1980 Census data for the block groups or enumeration districts comprising the segments. Those segments with at least a 30 percent minority population in 1980 were classified as "Hispanic" or "Black--not Hispanic," depending on the predominant minority group in the area. All remaining segments were classified as "Other race/ethnic group."

For the NORC sample, the classifications were based on actual responses to the NMES screener questionnaire. Those segments with at least a 30 percent sample representation of minority groups were classified as "Hispanic" or "Black--not Hispanic," depending on which group had the largest sample representation. Otherwise, the segment was classified as "Other race/ethnic group."

(3) Characteristic income level of the sample segment containing the DU (Poor, Other income).

For the Westat sample, 1980 Census data were used to classify each segment into four categories based on the median residential home value or the median rent for the segment depending on whether homeowners or renters predominated in the segment. Those segments with the lowest home or rental value category were classified as "Poor," with the remaining DUs given a classification of "Other income."

For the NORC sample, the classifications were based on actual responses to the NMES screener questionnaire. When at least 30 percent of the responding DUs in a segment had a household income at or below 125 percent of the poverty level, the segment was classified as "Poor." Otherwise, the segment was classified as "Other income."

(4) Census region (Northeast, Midwest, South, West).

(5) Data Collection Organization (Westat, NORC).

Generally, when the number of responding dwelling units characterizing a weighting class was less than 40, the classes were collapsed across categories of the weighting class variables in the order listed above, until this minimum sample size specification was achieved.

More specifically, if we define WDUBASE(i) as the initial dwelling unit weight for the ith DU (which represents the reciprocal of the DU's selection probability), the nonresponse adjustment for the cth weighting class takes the form:

$$A(c) = \frac{\sum_{ODU \xi C} WDUBASE(i)}{\sum_{ODUR \xi C} WDUBASE(i)}$$

where $ODU \xi C$ represents all occupied dwelling units in c, and $ODUR \xi C$ represents dwelling units with at least one responding reporting unit in c.

Consequently, the nonresponse adjusted weight for the ith responding DU in weighting class c takes the form

$$WDURESP(i) = A(c) \cdot (WDUBASE(i))$$

Direct application of the nonresponse-adjusted sampling weights would yield independent estimates of population parameters for the Westat and the NORC samples. Consequently, a further adjustment was incorporated in the sampling weights to yield national estimates of population parameters when both samples are combined. For all responding DUs from the Westat sample, the nonresponse-adjusted weights were reduced by a factor of .485 while for those from NORC, the corresponding adjustment was a factor of .515. These factors reflect the proportion of the original sample selected by each organization and serve to minimize the variance of population estimates derived from the combined sample.

A poststratification adjustment was also implemented at the DU level by ratio-adjusting the nonresponse adjusted weights to reflect CPS estimates of the number of occupied dwelling units as of March, 1987 (the mid-point of the NMES Round One interview field period). The weighting classes constructed for use in the poststratification adjustments were defined by cross-classifications of the following variables:

(1) Race/ethnicity of the reference person in the primary reference unit (RU) of the DU (Hispanic, Black -- not Hispanic, Other).

(2) Age (in years) of the reference person in the primary RU of the DU (under 35, 35 to 44, 45 to 64, 65 and older).

(3) Number of people within the DU (1, 2, 3, 4+).

(4) Census region (Northeast, Midwest, South, West).

As before, when the number of responding DUs in a weighting class was less than 40, the classes were redefined by collapsing the categories of the weighting classes in the order listed above. This approach was taken both at the reporting unit level and the person level.

More specifically, if we define WDURESP(i) as the nonresponse adjusted weight for the ith DU, the poststratification adjustment for the cth weighting class takes the form:

$$B(c) = \frac{CPSTOTAL(c)}{\sum_{RDU \xi C} WDURESP(i)}$$

where CPSTOTAL(c) is the March 1987 CPS population estimate of occupied dwelling units that are characterized by the definition of the cth weighting class, and RDU ξ C represents the responding dwelling units in c.

Consequently, the nonresponse adjusted and poststratified weight for the ith responding DU in weighting class c takes the form

$$WDUPOST(i) = B(c) \cdot (WDURESP(i))$$

Reporting Unit Sampling Weights

A reporting unit (RU) consists of one person living alone or unrelated to others in the same dwelling unit, or a group of two or more persons related to each other by blood, marriage, adoption, or foster care whose usual residence is the assigned DU. More than one reporting unit may be living in the sampled DU. Reporting units are comparable to census classifications of unrelated individuals plus families.

The final nonresponse adjusted and poststratified DU level weight was assigned to each RU within the associated dwelling unit (WRU(i) = WDUPOST(i)). These initial RU level weights were then further poststratified to reflect CPS figures for unrelated individuals plus families for March, 1987. This adjustment served as both a nonresponse and poststratification adjustment at the RU level. The weighting classes that were considered for the RU level postratification adjustment were defined by a cross-classification of the following variables:

(1) Age (in years) of the reference person in the RU (under 35, 35-44, 45-64, 65 and older).

(2) Race/ethnicity of reference person in the RU (Hispanic, Black--not Hispanic, or other).

(3) Number of persons in the RU (1, 2, 3, 4+).

(4) Type of RU by reference person (married--spouse present, male reference person--no spouse present, female reference person--no spouse present) where the reference person is the individual owning or renting the home.

More specifically, the RU level poststratification adjustment for the cth weighting class takes the form

$$C(c) = \frac{CPSRU(c)}{\sum_{RRU \xi c} WRU(i)}$$

where CPSRU(c) reflects the March 1987 CPS estimate of families or unrelated individuals defined by the cth weighting class and RRU ξ c represents all responding reporting units in c.

Consequently, the poststratified weight for the ith responding RU in weighting class c takes the form

$$WRUPOST(i) = C(c) \cdot (WRU(i))$$

Person Level Sampling Weights

Each person in a responding RU was initially assigned the RU poststratified weight (WTPER(i) = WRUPOST(i)). The NMES person level weights were then poststratified to March 1987 CPS population totals. To establish consistency between family level and person level estimates in NMES, the reference person for each RU, in addition to married couples, retained the value of the RU weight as their final person weight. The person level weights of all other NMES respondents were poststratified to CPS totals within weighting classes defined by a cross-classification of the following variables:

(1) Age, in years, (0, 1-4, 5-9, 10-14, 15-19, 20-29, 30-34, 35-44, 45-54, 55-59, 60-64, 65-69, 70-74, 75-79, 80+).

(2) Gender

(3) Race/Ethnicity (Hispanic, Black--not Hispanic, Other).

More specifically, the person level poststratification adjustment for the cth weighting class takes the form

$$D(c) = 1 \text{ for reference persons and married couples (denoted by } L(i) = 1),$$

and

$$D(c) = \frac{CPSPER(c) - \sum_{i \xi C} WTPER(i)(L(i))}{\sum_{i \xi C} WTPER(i) \cdot (1-L(i))}$$

for all remaining NMES respondents (denoted by $L(i) = 0$)

where CPSPER(c) reflects the March 1987 CPS estimate of persons defined by the cth weighting class.

Consequently, the poststratified weight for the ith responding person in weighting class c takes the form

$$WPPOST(i) = D(c) \cdot (WTPER(i))$$

Nonresponse Adjustment for Part-Year Response

In addition to complete survey nonresponse encountered and adjusted for in the NMES, panel surveys administered over several interview rounds also encounter **partial nonresponse**, where initially responding survey participants provide data for only part of the time

they are eligible to respond. For example, initially responding persons sometimes refuse to participate in later rounds of data collection. Inability to locate participants who change residence similarly results in partial nonresponse. This loss of later interviews for initially responding individuals is commonly referred to as sample attrition.

In the NMES household survey, approximately 6 percent of the survey participants did not provide data for the entire period in 1987 during which they were eligible to respond, i.e., the time in 1987 in which they were civilian, noninstitutionalized residents of the United States. In view of this modest level of partial nonresponse that characterized the NMES sample, individuals with partial nonresponse were treated as complete nonrespondents. Using this approach, only those NMES sample persons with complete response profiles for their period of eligibility in 1987 were included in the prescribed medicine analyses. Sample persons with complete response profiles include those individuals who died or left the civilian noninstitutionalized population during the course of 1987, but who responded for their entire period of eligibility in 1987.

An additional nonresponse and poststratification adjustment was made to the person level sampling weights to account for this type of partial nonresponse. The person level weights of the full-year respondents were poststratified to March 1987 CPS population totals within weighting classes defined by a cross-classification of age, gender, and race/ethnicity (considering the same categories as specified above).

More specifically, the partial nonresponse and poststratification adjustment for the cth weighting class takes the form

$$E(c) = \frac{CPSPER(c)}{\sum_{R \xi C} WTPER(i)}$$

where CPSPER(c) reflects the March 1987 CPS estimate of persons defined by the cth weighting class, and $R \xi C$ represents all full-year respondents in c.

Consequently, the partial nonresponse adjusted poststratified weight for the ith complete respondent in weighting class c takes the form

$$WTFULL(i) = E(c) \cdot (WTPER(i))$$

Event Level Analysis Weight

For event level prescribed medicine estimates, the event level analysis weight takes the value of the final person level sampling weight for the associated NMES full-year respondent (WTFULL(i)). The event level uses each purchase or other acquisition of a prescribed medicine as the basis of analysis. More specifically, for the jth prescribed medicine event that characterizes the ith NMES sample respondent, the event level prescribed medicine weight, WTEVENT(ij) is specified as:

$$WTEVENT(ij) = WTFULL(i).$$

G.2 Variance Estimation Procedures

The Household Component of the National Medical Expenditure Survey (NMES) is characterized by a complex survey design which includes stratification, clustering, and disproportionate sampling. This departure from simple random sampling assumptions requires special consideration with regard to variance estimation and analysis. Several methods for approximating sampling variances, which incorporate the components of a complex survey design, have been developed and can be considered for application to NMES data (Cohen, Burt and Jones, 1986). The three most generally accepted and frequently used techniques are the method of balanced repeated replication (BRR), the "jackknife" method, and the Taylor series linearization method (Cohen and Kalsbeek, 1981). These variance estimation strategies have been incorporated as procedures in several of the widely used statistical packages.

One can gain access to repeated replication procedures to compute estimates of regression coefficients and their sampling errors for data from complex survey designs through the use of the OSIRIS IV Statistical Analysis and Data Management Software Systems Package (Van Eck, 1979). The OSIRIS Repeated Replication Sampling Error Analysis procedure, REPERR, allows for the creation of replication by using one of three methods: balanced half-sample, jack-knife, or user-specified replications. In addition, the SAS accessible NASSREG procedure developed by Westat (Chu et al., 1985) also uses the balanced half-sample replication technique for variance estimates of regression coefficients. The balanced half-sample method of variance estimation for means, proportions, totals, and rates can be implemented through the Health

Examination Survey Variance and Cross-Tabulation Program developed by the National Center for Health Statistics (Jones, 1983).

Appropriate variance estimates for means, proportions and totals using the Taylor series linearization method can be generated through the SESUDAAN program (Standard Errors Program for Computing of Standardized Rates From Sample Survey Data) developed by the Research Triangle Institute (Shah 1981a) and accessible through SAS. Similarly, variance estimates of ratios can be generated through the SAS accessible procedure, RATIOEST (Standard Errors Program for Computing of Ratio Estimates From Sample Survey Data), also by using a linearization approximation (Shah, 1981b).

The OSIRIS IV procedure, PSALMS (Sampling Error Analysis), provides another mechanism for computing variance estimates for means, proportions, totals, and ratios derived from complex survey data by using the Taylor series linearization method. The same capabilities are shared by the SUPERCARP program (Cluster Analysis and Regression Program) developed by the Survey Section of the Statistical Laboratory at Iowa State University (Hidiroglou, Fuller, and Hickman, 1980). In addition, the procedure provides standard errors for regression coefficients, again by using a Taylor series linearization method. A complementary procedure, which also generates standard errors of regression coefficients by using complex survey data, is the SURREGR program (Standard Errors of Regression Coefficients From Sample Survey Data; Holt, 1977).

Due to user facility and computational efficiency, the SESUDAAN procedure is recommended for standard error estimates of population means, proportions or totals, and the SURREGR procedure is recommended for standard error estimates of regression coefficients. To obtain variance estimates of sample statistics by means of these recommended procedures, two additional variables must be used in concert with the appropriate sampling weight:

(1) STRATUM, which indicates the respective sampling stratum from which the primary sampling unit (PSU) was selected, and

(2) HALFSAMP, which indicates the respective primary sampling units within a given stratum.

For variance estimation purposes, self-representing PSUs were treated as strata in their own right, and their segments divided in a uniform manner to form two pseudo-PSUs.

TECHNICAL APPENDIX H:
RELIABILITY OF ESTIMATES

TECHNICAL APPENDIX H: RELIABILITY OF ESTIMATES

Since the statistics presented in this report are based on a probability sample of the population rather than the entire population, they may differ somewhat from the figures that would have been obtained if a complete census had been taken. This potential difference between sample results and a complete count is the sampling error, which is measured by a statistic called the standard error of the estimate.

The sample estimate and an estimate of its standard error together permit the construction of an interval estimate of specified confidence to the effect that the interval includes the estimate that would be obtained from a complete census. The interval from one standard error below the estimate to one standard error above the estimate would include the value obtained from a census 68 percent of the time. The interval from two standard errors below the estimate to two standard errors above the estimate would include the value obtained from a census 95 percent of the time. For the estimates presented in Tables 1-6 in the report, standard errors are provided in Tables H-1-6.

The relative standard error is defined as the standard error of the estimate divided by the absolute value of the quantity being estimated. Estimated relative standard errors can be calculated using the estimates presented in the body of the text and the standard errors presented in this appendix. Relative standard errors provide an indication of the reliability of the estimate. Relative standard errors of 5 percent or less are indicative of a high level of precision; 6 to 15 percent, good; and 16 to 30 percent, moderate. Statistics with relative standard errors in excess of 30 percent are not considered precise and should be interpreted cautiously. All estimates with a relative standard error of 30 percent or more have been flagged in the report by an asterisk.

Tests of statistical significance were used to determine whether differences between population estimates exist at specified levels of confidence or whether they simply occurred by chance. The standard error of the difference between statistics was approximated by the square root of the sum of the squares of the standard error estimates for the two statistics. This approximation ignores the covariance between the two statistics. The approximation will be conservative (too large) for positively correlated statistics and liberal (too small) for negatively correlated statistics. Differences were tested using Z-scores having asymptotic normal properties

at the 0.05 level of significance. Unless otherwise noted, only statistically significant differences between estimates are discussed in the text.

Table H-1. Standard errors for Table 1: Annual expenditures on prescribed medicines and prescriptions obtained by noninstitutionalized Medicare beneficiaries (NMES Household Data, 1987)

Population characteristics	Total beneficiaries		Prescriptions		Prescription expenditures		Average number of prescriptions per beneficiary	Average annual expenditure per beneficiary
	Number (in thousands)	Percent	Number (in millions)	Percent	Total (in millions)	Percent		
Total	898.635	—	16.701	—	291.302	—	0.317	5.581
Elderly Medicare beneficiaries	860.162	.485	15.426	.950	270.409	1.179	0.331	34.023
Medicare beneficiaries under 65 years of age	160.770	.485	5.032	.950	105.657	1.179	1.415	5.664

Table H-2. Standard errors for Table 2: Annual expenditures for prescribed medicines obtained by noninstitutionalized Medicare beneficiaries: Percentage distributions and cumulative percent by expenditure intervals (NMES Household Data, 1987)

Annual expenditures	Beneficiaries			Annual expenditures ($)		
	Total (in thousands)	Percent	Cumulative percent	Total (in millions)	Percent of total	Cumulative percent
Total	898.635			291.302		
$ 0	239.970	.618		0		
1-50	193.153	.496		4.877	.068	
51-100	171.070	.409		12.798	.154	
101-150	138.122	.379		17.247	.201	
151-200	110.380	.307		19.515	.234	
201-250	128.695	.347		28.788	.326	
251-300	106.543	.275		29.436	.299	
301-350	79.475	.221		25.798	.289	
351-400	95.640	.259		35.870	.377	
401-450	73.000	.214		30.876	.342	
451-500	75.570	.217		35.682	.394	
501-550	58.185	.180		30.473	.378	
551-600	61.183	.186		35.296	.411	
601-650	54.272	.165		34.032	.381	
651-700	50.071	.154		33.852	.402	
701-750	46.255	.137		33.566	.374	
751-800	43.496	.137		33.842	.413	
801-900	57.344	.180		48.598	.561	
901-1000	55.993	.170		53.412	.602	
1001-1200	61.427	.187		66.781	.704	
1201-1500	55.308	.175		74.310	.844	
1501 or more	50.448	.154		112.527	1.240	

Table H-3. Standard errors for Table 3: Average charges for prescribed medicines and prescriptions obtained by the elderly Medicare population: United States, 1980 and 1987

Year[a]	Percent of elderly Medicare population using prescribed medicines	Average number of prescriptions per elderly Medicare person	Average annual expenditure per elderly Medicare person	Average expenditure per prescription
1980[a]	3.620	0.454	3.507	0.106
1987[b]	0.63	0.331	5.664	0.181

[a]Standard errors for 1980 are from NMCUES data (LaVange and Silverman, 1987).

[b]Standard errors for 1987 are from NMES data.

Table H-4. Standard errors for Table 4: Comparison of 1987 annual expenditures for prescribed medicines obtained by noninstitutionalized Medicare beneficiaries (NMES Household Data, 1987)

Source[a]	Average annual expenditure per beneficiary	Percentage of beneficiaries with annual expenditures over $500	Total annual expenditures of beneficiaries with annual expenditures over $500 (in millions)
NMES			
Elderly	5.664	.59	198.099
Total	5.581	.57	212.540

[a]Standard error estimates are provided for NMES data only.

Table H-5. Standard errors for Table 5: Prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by selected population characteristics (NMES Household Data, 1987)

Population characteristics	Total beneficiaries (in thousands)	Percent beneficiaries without prescribed medicines	Percent beneficiaries with at least one prescribed medicine	Mean prescribed medicines per beneficiary	Mean prescribed medicines per beneficiary with at least one prescribed medicine
Total	898.635	.620	.620	.317	.368
Age in Years					
Less than 65	200.818	1.708	1.708	.984	1.184
65 to 69	298.370	1.049	1.049	.484	.560
70 to 74	337.091	1.214	1.214	.539	.591
75 to 79	239.618	1.151	1.151	.639	.667
80 to 84	190.992	1.438	1.438	.783	.794
85 or older	123.710	1.658	1.658	.845	.956
Age and Gender					
Male	420.101	0.900	0.900	.382	.453
Less than 65	139.319	2.475	2.475	1.262	1.581
65 to 69	179.830	1.630	1.630	.622	.709
70 to 74	167.827	1.759	1.759	.667	.775
75 to 79	127.600	2.058	2.058	.804	.883
80 to 84	98.136	3.050	3.050	1.180	1.292
85 or older	63.286	3.376	3.376	1.264	1.450
Female	536.730	0.709	0.709	.389	.441
Less than 65	126.597	2.219	2.219	1.412	1.564
65 to 69	169.425	1.342	1.342	.621	.772
70 to 74	212.378	1.461	1.461	.715	.767
75 to 79	149.185	1.316	1.316	.860	.885
80 to 84	136.318	1.390	1.390	.989	1.018
85 or older	93.943	2.107	2.107	1.080	1.208
Difficulties with Activities of Daily Living					
None	840.532	0.674	0.674	.311	.362
One	104.975	1.632	1.632	1.434	1.500
Two or more	126.319	1.654	1.654	1.135	1.150
Perceived Health Status					
Excellent	161.626	2.530	2.530	.470	.683
Good	489.100	0.885	0.885	.272	.309
Fair	366.542	0.746	0.746	.496	.496
Poor	218.099	1.020	1.020	1.054	1.060
Ethnic/Racial Background					
White	922.063	0.630	0.630	.330	.377
Black	258.794	1.363	1.363	.684	.797
Hispanic	169.445	3.886	3.886	1.430	1.838

Table H-5. Standard errors for Table 5: Prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by selected population characteristics (NMES Household Data, 1987) *continued*

Population characteristics	Total beneficiaries (in thousands)	Percent beneficiaries without prescribed medicines	Percent beneficiaries with at least one prescribed medicine	Mean prescribed medicines per beneficiary	Mean prescribed medicines per beneficiary with at least one prescribed medicine
Total	898.635	.620	.620	.317	.368
Family Income Related to Poverty Status					
Poor	295.636	1.334	1.334	.732	.778
Near poor	139.882	1.829	1.829	1.061	1.152
Low income	246.437	1.230	1.230	.658	.806
Middle income	411.959	1.074	1.074	.460	.493
High income	374.716	1.258	1.258	.520	.623
Health Insurance Status					
Medicare only	290.521	1.350	1.350	.661	.857
Medicaid	233.391	1.381	1.381	1.105	1.158
Private	768.765	0.738	0.738	.351	.393
Employment Status					
Employed	178.927	1.899	1.899	.539	.632
Not employed	854.186	0.622	0.622	.345	.393
Education					
Less than 12 years	537.571	.848	.848	.415	.465
12 years	395.819	1.007	1.007	.502	.571
13 years or more	327.979	1.385	1.385	.602	.648
U.S. Census Region					
Northeast	419.522	1.772	1.772	.631	.691
North Central	350.504	1.252	1.252	.590	.762
South	692.009	0.878	0.878	.622	.691
West	374.596	1.049	1.049	.549	.639

Table H-6. Standard errors for Table 6: Number of prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by selected population characteristics (NMES Household Data, 1987)

Population characteristics	Number of prescriptions (in millions)	Mean prescribed medicines per beneficiary	Percent of total beneficiaries				
			Without prescribed medicines	With 1-4 prescribed medicines	With 5-9 prescribed medicines	With 10-20 prescribed medicines	With 21 + prescribed medicines
Total	16.701	.317	0.620	0.633	0.467	0.598	0.797
Age in Years							
Less than 65	5.461	.984	1.708	1.514	1.355	1.568	2.024
65 to 69	6.137	.484	1.049	1.130	0.756	0.983	1.078
70 to 74	6.299	.539	1.214	0.900	1.018	1.335	1.335
75 to 79	4.475	.640	1.151	1.456	1.099	1.236	1.514
80 to 84	4.347	.783	1.438	1.422	1.606	1.870	2.324
85 or older	2.259	.846	1.658	2.471	2.218	2.624	2.187
Age and Gender							
Male	7.158	.382	0.900	0.930	0.763	1.007	0.950
Less than 65	3.688	1.262	2.475	2.134	1.754	2.333	2.711
65 to 69	3.390	.622	1.630	1.723	1.163	1.528	1.541
70 to 74	2.937	.667	1.759	1.480	1.465	1.895	1.762
75 to 79	1.991	.804	2.058	2.275	1.841	2.048	2.165
80 to 84	1.890	1.180	3.050	2.099	2.864	2.962	3.157
85 or older	1.094	1.264	3.376	3.796	3.972	3.989	2.893
Female	11.895	.389	0.709	0.746	0.644	0.739	1.013
Less than 65	3.629	1.412	2.219	2.213	2.115	2.074	2.939
65 to 69	4.224	.621	1.341	1.388	1.109	1.305	1.433
70 to 74	4.685	.715	1.461	1.199	1.309	1.708	1.792
75 to 79	3.447	.860	1.316	1.661	1.605	1.502	2.141
80 to 84	3.539	.988	1.390	2.083	1.940	2.503	2.944
85 or older	2.021	1.080	2.107	3.334	2.754	3.085	2.903
Difficulties with Activities of Daily Living							
None	14.163	.311	0.674	0.680	0.526	0.637	0.804
One	3.544	1.434	1.632	1.740	2.006	2.628	3.163
Two or more	3.832	1.135	1.654	1.649	1.800	1.983	2.472
Perceived Health Status							
Excellent	1.484	.470	2.530	2.182	1.938	1.801	1.162
Good	6.028	.272	0.885	0.962	0.750	0.968	0.685
Fair	8.537	.496	0.746	0.779	0.729	1.075	1.271
Poor	7.642	1.054	1.020	1.011	1.088	1.466	1.809
Ethnic/Racial Background							
White	15.714	.330	0.630	0.688	0.537	0.597	0.837
Black	4.556	.684	1.363	1.631	1.191	1.948	1.639
Hispanic	2.667	1.430	3.886	3.403	2.565	2.526	3.652

Table H-6. Standard errors for Table 6: Number of prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by selected population characteristics (NMES Household Data, 1987) *continued*

Population characteristics	Number of prescriptions (in millions)	Mean prescribed medicines per beneficiary	Percent of total beneficiaries				
			Without prescribed medicines	With 1-4 prescribed medicines	With 5-9 prescribed medicines	With 10-20 prescribed medicines	With 21 + prescribed medicines
Total	16.701	.317	0.620	0.633	0.467	0.598	0.797
Family Income Related to Poverty Status							
Poor	6.507	.732	1.334	1.528	1.307	1.348	1.860
Near poor	3.473	1.061	1.829	1.712	1.711	2.276	2.555
Low income	5.551	.658	1.230	1.087	1.176	1.321	1.553
Middle income	7.536	.460	1.074	1.052	0.793	1.028	1.281
High income	6.108	.520	1.258	1.090	0.967	1.064	1.359
Health Insurance Status							
Medicare only	5.948	.661	1.350	1.378	1.184	1.194	1.500
Medicaid	5.581	1.105	1.381	1.605	1.674	1.716	2.538
Private	13.296	.351	0.738	0.670	0.596	0.695	0.836
Employment Status							
Employed	2.551	.539	1.899	1.570	1.486	1.723	1.483
Not employed	16.387	.345	0.622	0.654	0.504	0.619	0.871
Education							
Less than 12 years	11.381	.415	0.848	0.854	0.666	0.879	1.039
12 years	7.050	.502	1.007	1.059	0.842	1.148	1.061
13 years or more	5.792	.602	1.385	1.025	1.177	1.363	1.289
U.S. Census Region							
Northeast	9.246	.631	1.772	1.418	1.117	1.400	1.924
North Central	6.519	.590	1.252	1.303	1.067	1.065	1.345
South	11.828	.622	0.878	1.029	0.672	1.065	1.506
West	5.482	.549	1.049	1.542	0.932	1.365	1.186

Table H-7. Standard errors for Table 7: Annual expenditures for prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by selected population characteristics (NMES Household Data, 1987)

Population characteristics	Total prescription expenditure (in millions)	Mean expenditure per beneficiary	Percent distribution of beneficiaries by total annual expenditures						
			$0	$1-$150	$151-$300	$301-$500	$501-$600	$601-$700	$701 or more
Total	291.302	5.58	.618	.723	.521	.450	.225	.234	.472
Age in Years									
Less than 65	109.105	21.958	1.730	1.855	1.524	1.155	.982	.848	1.571
65 to 69	114.699	9.054	1.049	1.218	.873	.712	.469	.423	.685
70 to 74	114.209	9.434	1.218	1.316	1.022	.955	.550	.448	.827
75 to 79	77.006	11.622	1.187	1.700	1.372	1.036	.641	.405	.960
80 to 84	77.431	16.098	1.492	1.928	1.696	1.700	.916	.767	1.400
85 or older	37.805	14.178	1.658	2.473	2.195	1.496	.803	.683	1.498
Age and Gender									
Male	135.745	7.992	.904	1.085	.849	.655	.325	.423	.644
Less than 65	74.505	27.759	2.508	2.551	2.287	1.712	1.418	1.289	2.127
65 to 69	66.440	13.111	1.626	1.786	1.514	1.240	.688	.697	.932
70 to 74	61.124	13.691	1.783	2.274	1.376	1.214	.762	.700	1.268
75 to 79	36.413	15.866	2.062	2.462	2.073	1.523	.873	.621	1.200
80 to 84	35.442	24.896	3.049	3.552	2.324	2.438	1.399	1.078	2.303
85 or older	18.875	21.633	3.376	4.897	3.862	3.329	1.743	.923	2.390
Female	206.966	6.947	.700	.851	.677	.598	.337	.302	.584
Less than 65	79.195	32.953	2.223	2.661	2.070	1.710	1.451	1.048	2.201
65 to 69	78.047	11.149	1.329	1.613	1.340	.948	.650	.490	.939
70 to 74	80.214	12.956	1.446	1.450	1.323	1.334	.767	.660	1.098
75 to 79	58.954	15.421	1.372	2.085	1.892	1.435	.939	.753	1.325
80 to 84	63.574	21.275	1.470	2.712	2.372	2.144	1.135	1.004	1.655
85 or older	33.022	18.664	2.107	3.445	2.637	1.965	.886	.909	1.789
Difficulties with Activities of Daily Living									
None	243.762	5.379	.669	.782	.586	.491	.258	.256	.455
One	67.286	30.037	1.632	2.536	1.685	1.806	1.308	1.144	2.510
Two or more	70.035	24.192	1.654	2.454	1.791	1.843	1.403	1.020	1.795
Perceived Health Status									
Excellent	30.144	9.671	2.518	2.353	1.345	1.233	.534	.620	.537
Good	115.745	6.318	.873	1.035	.842	.619	.387	.308	.452
Fair	148.647	9.580	.757	1.024	.916	.836	.447	.397	.998
Poor	128.784	22.093	1.025	1.523	1.360	1.339	1.071	.853	1.535
Ethnic/Racial Background									
White	279.321	6.025	.622	.785	.573	.508	.252	.264	.504
Black	70.276	12.526	1.413	1.791	1.535	1.277	.532	.663	1.010
Hispanic	47.435	26.287	3.886	3.432	2.782	2.260	1.368	.969	2.001

Table H-7. Standard errors for Table 7: Annual expenditures for prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by selected population characteristics (NMES Household Data, 1987) *continued*

Population characteristics	Total prescription expenditure (in millions)	Mean expenditure per beneficiary	Percent distribution of beneficiaries by total annual expenditures						
			$0	$1-$150	$151-$300	$301-$500	$501-$600	$601-$700	$701 or more
Total	291.302	5.58	.618	.723	.521	.450	.225	.234	.472
Family Income Related to Poverty Status									
Poor	99.292	13.098	1.348	1.660	1.388	1.319	.742	.627	1.180
Near poor	65.815	24.608	1.863	2.374	2.152	2.116	1.228	.775	1.716
Low income	10.256	12.977	1.220	1.536	1.072	.921	.687	.505	1.012
Middle income	145.155	9.250	1.095	1.234	.868	.733	.440	.378	.742
High income	123.179	10.659	1.229	1.475	1.027	.851	.471	.519	.852
Health Insurance Status									
Medicare only	108.485	13.087	1.389	1.654	1.079	.808	.488	.528	.934
Medicaid	92.193	22.668	1.405	2.371	1.807	1.608	1.238	.731	1.845
Private	239.411	6.045	.728	.808	.670	.542	.300	.288	.533
Employment Status									
Employed	47.512	9.945	1.924	1.996	1.460	1.287	.766	.664	.648
Not employed	284.694	6.149	.623	.779	.554	.489	.247	.258	.518
Education									
Less than 12 years	184.301	7.387	.853	.985	.735	.669	.394	.284	.617
12 years	123.239	8.455	.991	1.195	1.000	.841	.506	.455	.748
13 years or more	117.020	13.909	1.386	1.399	1.249	1.052	.679	.599	.886
U.S. Census Region									
Northeast	154.015	10.812	1.750	1.490	1.126	1.131	.547	.584	.861
North Central	117.522	11.171	1.265	1.547	1.214	.809	.401	.482	.917
South	205.629	9.440	.879	1.215	.759	.778	.366	.335	.812
West	101.403	11.679	1.014	1.370	1.079	.860	.553	.468	1.083

Table H-8. Standard errors for Table 8: Prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by therapeutic function and selected population characteristics (NMES Household Data, 1987)

Population characteristics	Total prescribed medicines (in millions)	Percent distribution of total prescriptions by therapeutic function classification									
		Cardio-vascular	Central nervous system	Electrolytic, caloric, and water balance	Hormones and synthetic substi-tutes	Gastro-intestinal	Anti-infective	Eye, ear, nose and throat prepara-tions	Autonomic	Smooth muscle relaxants	All others
Total	16.701	.517	.506	.363	.308	.213	.158	.194	.240	.150	.254
Age in Years											
Less than 65	5.461	1.619	1.774	.893	.851	.710	.667	.342	.579	.465	.761
65 to 69	6.137	1.159	.693	.581	.599	.372	.277	.274	.406	.305	.476
70 to 74	6.299	1.051	.715	.612	.632	.570	.285	.393	.709	.375	.518
75 to 79	4.475	.972	.752	.703	.634	.548	.279	.551	.347	.338	.593
80 to 84	4.347	1.322	.994	.994	.758	.552	.340	.809	.448	.338	.592
85 or older	2.259	1.772	1.497	1.203	.828	.852	.456	.992	.553	.602	.895
Age and Gender											
Male	7.158	.776	.781	.509	.503	.384	.284	.345	.305	.286	.403
Less than 65	3.688	2.488	2.621	1.200	.889	1.283	1.042	.649	.775	.654	1.045
65 to 69	3.390	1.806	1.079	.871	.916	.487	.482	.518	.628	.526	.749
70 to 74	2.937	1.402	.982	.825	1.059	.627	.457	.613	.706	.717	.811
75 to 79	1.991	1.851	1.130	1.228	1.249	.837	.501	.962	.561	.630	1.001
80 to 84	1.890	2.228	2.031	1.711	1.184	1.097	.680	1.671	1.095	.787	1.414
85 or older	1.094	3.933	1.967	2.409	1.746	1.565	.951	2.591	1.508	1.702	1.267
Female	11.895	.645	.698	.452	.410	.291	.194	.219	.321	.170	.348
Less than 65	3.629	1.906	2.714	1.221	1.381	.701	.851	.238	.884	.557	1.006
65 to 69	4.224	1.368	.993	.737	.858	.470	.345	.267	.548	.361	.630
70 to 74	4.685	1.351	.977	.781	.712	.839	.377	.474	1.008	.398	.738
75 to 79	3.447	1.257	.968	.909	.587	.693	.366	.680	.423	.394	.675
80 to 84	3.539	1.734	1.351	1.189	.899	.675	.391	.811	.440	.347	.667
85 or older	2.021	1.908	1.890	1.252	.922	1.049	.424	.838	.495	.417	1.146
Difficulties with Activities of Daily Living											
None	14.163	.574	.566	.383	.345	.268	.186	.227	.293	.176	.302
One	3.544	1.690	2.233	1.087	.887	1.136	.587	.797	.630	.500	.691
Two or more	3.832	1.355	1.110	.955	.795	.675	.404	.498	.463	.469	.907

Table H-8. Standard errors for Table 8: Prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by therapeutic function and selected population characteristics (NMES Household Data, 1987) *continued*

Population characteristics	Total prescribed medicines (in millions)	Percent distribution of total prescriptions by therapeutic function classification									
		Cardio-vascular	Central nervous system	Electrolytic, caloric, and water balance	Hormones and synthetic substi-tutes	Gastro-intestinal	Anti-infective	Eye, ear, nose and throat prepara-tions	Autonomic	Smooth muscle relaxants	All others
Total	16.701	.517	.506	.363	.308	.213	.158	.194	.240	.150	.254
Perceived Health Status											
Excellent	1.484	3.069	2.369	1.777	1.748	.695	1.063	1.806	.606	.667	1.431
Good	6.028	.931	.849	.672	.562	.318	.362	.367	.317	.297	.471
Fair	8.537	.767	.919	.546	.421	.489	.259	.303	.409	.263	.313
Poor	7.642	1.202	.928	.624	.710	.418	.241	.327	.467	.288	.518
Ethnic/Racial Background											
White	15.714	.551	.565	.388	.346	.243	.183	.197	.270	.164	.288
Black	4.556	1.353	.953	.707	.793	.484	.357	.925	.507	.354	.638
Hispanic	2.667	2.668	3.389	1.686	1.316	1.069	.975	.852	.875	.842	.793
Family Income Related to Poverty Status											
Poor	6.507	1.457	1.098	.943	.595	.618	.607	.562	.461	.396	.576
Near poor	3.473	1.497	1.941	1.313	1.020	.766	.343	.629	.376	.481	.862
Low income	5.551	.954	1.324	.705	.646	.395	.323	.482	.441	.355	.599
Middle income	7.536	1.047	.781	.667	.527	.505	.243	.340	.414	.289	.430
High income	6.108	.962	.896	.561	.495	.460	.313	.369	.639	.325	.507
Health Insurance Status											
Medicare only	5.948	1.217	1.376	.855	.658	.448	.530	.388	.476	.438	.710
Medicaid	5.581	1.342	1.226	.868	.799	.632	.387	.630	.523	.594	.762
Private	13.296	.545	.561	.426	.345	.258	.171	.244	.301	.185	.313
Employment Status											
Employed	2.551	1.750	1.505	1.07	1.128	.695	.563	.658	.677	.656	.815
Not employed	16.387	.528	.533	.368	.318	.219	.161	.198	.257	.157	.255

Table H-8. Standard errors for Table 8: Prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by therapeutic function and selected population characteristics (NMES Household Data, 1987) *continued*

Population characteristics	Total prescribed medicines (in millions)	Percent distribution of total prescriptions by therapeutic function classification									
		Cardio-vascular	Central nervous system	Electrolytic, caloric, and water balance	Hormones and synthetic substi-tutes	Gastro-intestinal	Anti-infective	Eye, ear, nose and throat prepara-tions	Autonomic	Smooth muscle relaxants	All others
Total	16.701	.517	.506	.363	.308	.213	.158	.194	.240	.150	.254
Education											
Less than 12 years	11.381	.725	.689	.462	.442	.317	.248	.296	.218	.200	.339
12 years	7.050	.927	.813	.568	.548	.402	.242	.303	.589	.285	.481
13 years or more	5.792	1.286	1.178	.700	.550	.562	.375	.480	.423	.393	.572
U.S. Census Region											
Northeast	9.246	1.295	1.236	1.006	.708	.346	.289	.330	.339	.273	.495
North Central	6.519	.977	1.096	.601	.392	.398	.393	.430	.339	.360	.610
South	11.828	.866	.832	.567	.580	.373	.265	.355	.525	.232	.359
West	5.482	1.111	1.000	.773	.642	.637	.270	.355	.544	.350	.625

Table H-9. Standard errors for Table 9: Prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by major ICD-9 categories and selected population characteristics (NMES Household Data, 1987)

Population characteristics	Percent of total prescriptions by ICD-9 categories							
	Diseases of circulatory system	Endocrine disorders	Musculoskeletal disorders	Diseases of respiratory system	Diseases of nervous system	Diseases of digestive system	Diseases of genitourinary system	Others
Total	.707	.411	.295	.421	.335	.220	.119	.479
Age in Years								
Less than 65	2.400	1.030	.824	1.217	1.141	.720	.318	2.350
65 to 69	1.481	.845	.489	.771	.524	.344	.254	.811
70 to 74	1.214	.801	.516	1.126	.745	.627	.228	.743
75 to 79	1.351	.779	.632	.679	.638	.558	.268	.934
80 to 84	1.661	.800	.757	.880	.895	.419	.293	1.488
85 or older	2.432	1.067	1.011	1.102	1.161	.736	.582	1.552
Age and Gender								
Male	1.086	.659	.407	.644	.609	.366	.233	.944
Less than 65	3.025	1.340	1.193	1.076	1.970	1.111	.294	3.318
65 to 69	2.147	1.093	.646	1.429	.949	.423	.416	1.236
70 to 74	1.891	1.280	.620	1.511	.877	.611	.450	1.136
75 to 79	2.989	1.316	.940	1.407	.967	.643	.663	1.932
80 to 84	3.11	1.357	1.306	1.542	1.712	.993	.580	3.088
85 or older	4.879	2.225	1.043	3.285	3.044	1.438	1.512	2.163
Female	.875	.475	.389	.533	.375	.292	.146	.700
Less than 65	3.321	1.538	1.084	2.083	1.174	.751	.609	3.525
65 to 69	1.823	1.231	.793	.928	.544	.506	.356	1.023
70 to 74	1.598	.879	.743	1.493	1.024	.894	.261	1.072
75 to 79	1.407	.777	.794	.824	.844	.763	.213	1.041
80 to 84	2.144	.970	1.041	1.089	.989	.586	.281	1.619
85 or older	2.643	1.145	1.322	.844	1.049	.833	.357	2.012
Difficulties with Activities of Daily Living								
None	.795	.450	.290	.502	.327	.270	.132	.521
One	2.078	.879	1.202	1.387	1.098	.922	.241	2.157
Two or more	2.212	1.053	.940	.886	1.723	.389	.317	1.427
Perceived Health Status								
Excellent	3.174	1.462	1.615	1.529	1.836	.649	1.208	2.377
Good	1.298	.704	.554	.580	.501	.374	.194	.817
Fair	1.122	.550	.474	.762	.505	.477	.177	.980
Poor	1.492	.945	.656	.860	.832	.371	.236	1.122
Ethnic/Racial Background								
White	.768	.431	.307	.477	.356	.232	.119	.528
Black	1.948	1.169	.816	.864	.914	.507	.450	1.115
Hispanic	4.077	1.670	1.871	1.934	1.897	1.180	.977	2.393

Table H-9. Standard errors for Table 9: Prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by major ICD-9 categories and selected population characteristics (NMES Household Data, 1987) *continued*

Population characteristics	Percent of total prescriptions by ICD-9 categories							
	Diseases of circulatory system	Endocrine disorders	Musculoskeletal disorders	Diseases of respiratory system	Diseases of nervous system	Diseases of digestive system	Diseases of genitourinary system	Others
Total	.707	.411	.295	.421	.335	.220	.119	.479
Family Income Related to Poverty Status								
Poor	2.268	.838	.709	1.184	.675	.554	.293	1.425
Near poor	2.339	1.400	.768	1.037	.792	.799	.347	2.327
Low income	1.504	.945	.578	.773	.697	.484	.175	1.182
Middle income	1.238	.754	.470	.783	.601	.496	.226	.696
High income	1.417	.715	.655	1.084	.768	.466	.290	1.125
Health Insurance Status								
Medicare only	1.871	.974	.879	.866	.906	.588	.181	1.571
Medicaid	1.820	1.124	1.050	.853	.866	.556	.328	1.445
Private	.794	.475	.321	.528	.385	.239	.144	.555
Employment Status								
Employed	1.978	1.241	1.009	1.580	.910	.537	.594	1.59
Not employed	.713	.437	.307	.452	.349	.237	.116	.509
Education								
Less than 12 years	1.010	.584	.401	.404	.463	.338	.180	.745
12 years	1.296	.560	.535	.888	.503	.348	.250	1.070
13 years or more	1.603	.801	.748	1.121	1.016	.437	.255	1.278
U.S. Census Region								
Northeast	1.945	.836	.658	.793	.520	.348	.205	1.093
North Central	1.591	.599	.587	.930	.541	.425	.279	1.170
South	.918	.706	.419	.728	.587	.401	.217	.649
West	1.426	1.174	.838	.895	1.093	.457	.193	1.215

Table H-10. Standard errors for Table 10: Prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by generic or brand name classification and selected population characteristics (NMES Household Data, 1987)

Population characteristics	Number of prescriptions (in millions)	Percent generic name	Percent brand name
Total	16.701	.628	.635
Age in Years			
Less than 65	5.461	1.419	1.497
65 to 69	6.137	.985	1.003
70 to 74	6.299	.910	.879
75 to 79	4.475	1.296	1.312
80 to 84	4.347	1.412	1.527
85 or older	2.259	1.765	1.800
Age and Gender			
Male	7.158	.859	.886
Less than 65	3.688	1.921	2.115
65 to 69	3.390	1.535	1.564
70 to 74	2.937	1.230	1.218
75 to 79	1.991	1.823	1.872
80 to 84	1.890	1.956	2.035
85 or older	1.094	2.959	3.092
Female	11.895	.689	.700
Less than 65	3.629	2.005	2.100
65 to 69	4.224	1.044	1.080
70 to 74	4.685	1.141	1.144
75 to 79	3.447	1.558	1.575
80 to 84	3.539	1.644	1.780
85 or older	2.021	2.120	2.133
Difficulties with Activities of Daily Living			
None	14.163	.650	.662
One	3.544	1.587	1.660
Two or more	3.832	1.351	1.400
Perceived Health Status			
Excellent	1.484	3.209	3.285
Good	6.028	.879	.879
Fair	8.537	.836	.840
Poor	7.642	1.106	1.157
Ethnic/Racial Background			
White	15.714	.656	.659
Black	4.556	1.542	1.537
Hispanic	2.667	2.903	3.062

Table H-10. Standard errors for Table 10: Prescribed medicines obtained by noninstitutionalized Medicare beneficiaries by generic or brand name classification and selected population characteristics (NMES Household Data, 1987) *continued*

Population characteristics	Number of prescriptions (in millions)	Percent generic name	Percent brand name
Total	16.701	.628	.635
Family Income Related to Poverty Status			
Poor	6.507	1.495	1.440
Near poor	3.473	1.698	1.713
Low income	5.551	1.095	1.102
Middle income	7.536	.832	.867
High income	6.108	.978	1.060
Health Insurance Status			
Medicare only	5.948	1.266	1.366
Medicaid	5.581	1.726	1.680
Private	13.296	.653	.653
Employment Status			
Employed	2.551	1.854	1.972
Not employed	16.387	.640	.652
Education			
Less than 12 years	11.381	.852	.891
12 years	7.050	.887	.889
13 years or more	5.792	1.145	1.166
U.S. Census Region			
Northeast	9.246	1.514	1.465
North Central	6.519	1.558	1.531
South	11.828	.847	.927
West	5.482	1.118	1.145

Table H-11. Standard errors for Table 11: Mean annual expenditures for prescribed medicines and prescriptions obtained by persons 18 to 64 years of age: Estimated impact of basic health insurance coverage (NMCES HIES Data, 1977)

Health insurance coverage	Probability of obtaining a prescription	Number of prescriptions for persons with at least one prescription	Expenditures per person with prescription expenditures	Charge per prescription for prescriptions with charges
		Estimates without controls		
No Insurance	.047	.784	6.227	.409
Basic Coverage				
No prescription coverage	.071	.961	6.484	.393
Prescription coverage	.132	1.952	**	1.195
		Estimates with controls		
No Insurance	.080	.685	6.00	.463
Basic Coverage				
No prescription coverage	.102	.744	5.376	.377
Prescription coverage	.170	1.799	**	1.113

**Relative standard error is equal to or greater than 50 percent and the estimate is not reported.

Table H-12. Standard errors for Table 12: Mean annual expenditures for prescribed medicines and prescriptions obtained by persons 65 years of age and older: Estimated impact of basic health insurance coverage (NMCES HIES Data, 1977)

Health insurance coverage	Probability of obtaining a prescription	Number of prescriptions for persons with at least one prescription	Expenditures per person with prescription expenditures	Charge per prescription for prescriptions with charges
		Estimates without controls		
Basic Coverage				
No prescription coverage	.103	1.290	9.127	.310
Prescription coverage	.280	2.144	16.806	.759
		Estimates with controls		
Basic Coverage				
No prescription coverage	.202	.980	7.72	.134
Prescription coverage	.411	2.257	16.837	.744

Table H-13. Standard errors for Table 13: Mean annual expenditures for prescribed medicines and prescriptions obtained by persons 18 to 64 years of age: Estimated impact of major medical insurance coverage (NMCES HIES Data, 1977)

Health insurance coverage	Probability of obtaining a prescription	Number of prescriptions for persons with at least one prescription	Expenditures per person with prescription expenditures	Charge per prescription for prescriptions with charges
		Estimates without controls		
No Insurance	.047	.710	5.93	.436
Major Medical Coverage				
No prescription coverage	.206	1.993	**	1.660
Prescription coverage	.059	.716	6.967	.479
High deductible	.185	1.869	**	1.305
Medium deductible	.089	1.052	9.199	.687
Low deductible	.121	.979	9.063	.798
		Estimates with controls		
No Insurance	.065	.645	6.435	.500
Major Medical Coverage				
No prescription coverage	**	1.708	**	1.666
Prescription coverage	.084	.739	6.946	.472
High deductible	.280	1.778	**	1.303
Medium deductible	.120	.926	8.670	.684
Low deductible	.144	.979	9.260	.848

**Relative standard error is equal to or greater than 50 percent and the estimate is not reported.

Table H-14. Standard errors for Table 14: Mean annual expenditures for prescribed medicines and prescriptions obtained by persons 18 to 64 years of age: Estimated impact of basic and major medical insurance coverage (NMCES HIES Data, 1977)

Health insurance coverage	Probability of obtaining a prescription	Number of prescriptions for persons with at least one prescription	Expenditures per person with prescription expenditures	Charge per prescription for prescriptions with charges
		Estimates without controls		
No Insurance	.133	1.086	8.458	.594
Basic and Major Medical Coverage				
No prescription coverage	.159	2.389	**	.927
Prescription Coverage	.050	.571	4.452	.290
Low first dollar	a	2.116	**	1.078
High first dollar	a	1.869	**	.701
High deductible	a	1.208	8.947	.562
Medium deductible	a	.404	3.287	.222
Low deductible	a	.703	5.791	.369
		Estimates with controls		
No Insurance	**	.865	8.079	.694
Basic and Major Medical Coverage				
No prescription coverage	**	1.793	**	.877
Prescription coverage	.145	.448	3.435	.274
Low first dollar	a	1.619	**	1.069
High first dollar	a	1.316	9.153	.689
High deductible	a	.855	7.044	.596
Medium deductible	a	.348	2.823	.208
Low deductible	a	.582	4.795	.361

**Relative standard error is equal to or greater than 50 percent and the estimate is not reported.

[a]Not estimated because appropriate multiple choice logit software incorporating design effects does not exist. This software was needed because of the selection bias that was found in these equations for this group. Appropriate logit software incorporating design effects was available to correct for selection bias in the models that did not include choice of prescription insurance by generosity of coverage.

Table H-15. Standard errors for Table 15: Mean annual expenditures for prescribed medicines and prescriptions obtained by persons 65 years of age and older: Estimated impact of basic and major medical health insurance coverage (NMCES HIES Data, 1977)

Health insurance coverage	Probability of obtaining a prescription	Number of prescriptions for persons with at least one prescription	Expenditures per person with prescription expenditures	Charge per prescription for prescriptions with charges
		Estimates without controls		
Basic and Major Medical Coverage				
No prescription coverage	.238	2.630	15.492	.900
Prescription coverage	.152	1.919	12.108	.554
First dollar	.325	3.781	25.450	1.051
Medium/High deductible	.247	2.712	15.916	.793
Low deductible	.297	4.010	24.013	.902
		Estimates with controls		
Basic and Major Medical Coverage				
No prescription coverage	.339	2.040	11.769	.931
Prescription coverage	.298	1.425	9.134	.570
First dollar	**	3.275	7.660	1.227
Medium/High deductible	.369	1.815	10.943	.828
Low deductible	.437	3.290	21.925	1.000

**Relative standard error is equal to or greater than 50 percent and the estimate is not reported.

Table H-16. Standard errors for Table 16: Mean number of prescriptions per person: NMES Medicare beneficiaries and Medco beneficiaries 65 years of age and over, 1987

	Mean number of prescriptions per person	
	NMES	Medco[a]
Males		
65-69	.622	.145
70-74	.667	.173
75-79	.804	.226
80-84	1.180	.344
85+	1.264	.555
Females		
65-69	.621	.110
70-74	.715	.146
75-79	.860	.193
80-84	.989	.288
85+	1.080	.437

[a]Estimates for Medco are an approximation.

TECHNICAL APPENDIX I:
PRESCRIBED MEDICINE BOOKLET

Prescribed Medicine Booklet

DARK BLUE

OMB #: 0937-0163
Expires: 12/31/87

RU ID #: _____

BOOKLET # _____ OF _____ BOOKLETS

ROUND NUMBER: 1 2 3 4

DATE OF INTERVIEW: ____/____/____

Department of Health and Human Services
National Center for Health Services Research
and Health Care Technology Assesament

and

Health Care Financing Administration

NATIONAL MEDICAL EXPENDITURE SURVEY

HOUSEHOLD SURVEY AND
SURVEY OF AMERICAN INDIANS AND ALASKA NATIVES

MAIN SURVEY

N. PRESCRIBED MEDICINES BOOKLET

ASSURANCE OF CONFIDENTIALITY

Information contained on this form which would permit identification of any individual or establishment has been collected with a guarantee that it will be held in strict confidence by the contractor and NCHSR, will be used only for purposes stated in this study, and will not be disclosed or released to anyone other than authorized staff of NCHSR without the consent of the individual or the establishment in accordance with Section 308(d) of the Public Health Service Act (42 U.S.C. 242m).

NAME: _____

PERSON #: _____

MED. NAME: _____

_____

N10. RECORD NAME, PERSON #, AND NAME OF MEDICINE FROM ROSTER IN MEDICINE COLUMN.

You said (PERSON) had obtained (MEDICINE) since (REF. DATE).

N11. What condition was that for?
PROBE: Any other conditions?

CONDITION 1:

_____

_____

CC#: _____

CONDITION 2:

_____

_____

CC#: _____

N12. On what date since (REF. DATE) was this medicine first taken?

FIRST TAKEN:

_____/_____
MONTH DAY

N13. When was this medicine last taken?

LAST TAKEN:

_____/_____
MONTH DAY

N14. How many times was this medicine obtained or purchased for (PERSON) since (REF. DATE)?

DON'T KNOW ..... (-8)

_____
TIMES
..... -8

CONDITION 1: _____ _____ CC#: _____ CONDITION 2: _____ _____ CC#: _____	CONDITION 1: _____ _____ CC#: _____ CONDITION 2: _____ _____ CC#: _____	CONDITION 1: _____ _____ CC#: _____ CONDITION 2: _____ _____ CC#: _____	CONDITION 1: _____ _____ CC#: _____ CONDITION 2: _____ _____ CC#: _____
FIRST TAKEN: _____/_____ MONTH DAY	FIRST TAKEN: _____/_____ MONTH DAY	FIRST TAKEN: _____/_____ MONTH DAY	FIRST TAKEN: _____/_____ MONTH DAY
LAST TAKEN: _____/_____ MONTH DAY	LAST TAKEN: _____/_____ MONTH DAY	LAST TAKEN: _____/_____ MONTH DAY	LAST TAKEN: _____/_____ MONTH DAY
_____ TIMES ..... -8	_____ TIMES ..... -8	_____ TIMES ..... -8	_____ TIMES ..... -8

N15. Now I'd like to ask you about the charges for this prescription.
Have you received <u>any</u> bill or statement for this prescription?

Yes	①	..... 1 (N18)
No	②	..... 2 (N16)

N16. Do you expect to receive a bill or statement for this prescription?

Yes	①	..... 1 (N29, pg. 9)
No	②	..... 2 (N17)
DON'T KNOW	-8	..... -8 (N17)

N17. Why is that?

Paid at time of purchase	①	..... 1 (N18)
Bill sent directly to other source, haven't received statement yet (SPECIFY SOURCE) _____	②	..... 2 (N29, pg. 9)
No bill will be sent - Charges paid or to be paid by:		
HMO plan	③	..... 3 (N31, pg. 9)
VA	④	 4
Military facility	⑤	 5
Welfare/Medicaid	⑥	 6
Indian Health Service	⑦	 7
Indian Tribe/Inter-tribal council/ ALASKA NATIVE CORPORATION	⑧	 8
Free from provider	⑨	 9
Included with other charges	⑩	..... 10 (FF__; BOX N3 pg.9)

BOX N3, pg.9

..... 1 (N18) 2 (N16)	..... 1 (N18) 2 (N16)	..... 1 (N18) 2 (N16)	..... 1 (N18) 2 (N16)
..... 1 (N29, pg. 9) ..... 2 (N17) ..... -8 (N17)	..... 1 (N29, pg. 9) ..... 2 (N17) ..... -8 (N17)	..... 1 (N29, pg. 9) ..... 2 (N17) ..... -8 (N17)	..... 1 (N29, pg. 9) ..... 2 (N17) ..... -8 (N17)
..... 1 (N18) ..... 2 (N29, pg. 9) ..... 3 (N31, pg. 9) ..... 4 ..... 5 ..... 6 ..... 7 ..... 8 ..... 9 ..... 10 (FF__; BOX N3 pg.9)	..... 1 (N18) ..... 2 (N29, pg. 9) ..... 3 (N31, pg. 9) ..... 4 ..... 5 ..... 6 ..... 7 ..... 8 ..... 9 ..... 10 (FF__; BOX N3 pg.9)	..... 1 (N18) ..... 2 (N29, pg. 9) ..... 3 (N31, pg. 9) ..... 4 ..... 5 ..... 6 ..... 7 ..... 8 ..... 9 ..... 10 (FF__; BOX N3 pg.9)	..... 1 (N18) ..... 2 (N29, pg. 9) ..... 3 (N31, pg. 9) ..... 4 ..... 5 ..... 6 ..... 7 ..... 8 ..... 9 ..... 10 (FF__; BOX N3 pg.9)

N18. Including any amounts that may be paid by health insurance, Medicare, Medicaid, or other sources, how much was the total charge for this prescription? Please include all of the times (MEDICINE) was obtained for (PERSON) since (REF. DATE).

AMT: $ _____.___ (N19)

INCLUDED WITH OTHER CHARGES ..... (95) ..... 95 (FF__; BOX N3, pg.9

DON'T KNOW ..... (-8) ..... -8 (N19)

N19. Since purchase, how much of the total charge have you (or any member of your family) paid for (MEDICINE)?
RECORD AMOUNT PAID AND THEN, REFERRING TO N21, CIRCLE THE APPROPRIATE CODE.

AMT: $ _____.___
OR
PCT: _____%

NOTHING ..... (0) 0 (N24)
TOTAL CHARGE WAS PAID ..... (1) 1
LESS THAN TOTAL CHARGE PAID ..... (2) ..... 2 } (N20)
DON'T KNOW ..... -8 ..... -8

N20. Has any source reimbursed or paid you (or your family) back anything for the amount you paid?

Yes ..... (1) 1 (N21)
No ..... (2) 2 (N23)
DON'T KNOW ..... -8 ..... -8 (N23)

N21. Who reimbursed or paid you back?
RECORD SOURCE, THEN PROBE:
Anyone else?

SOURCE #1

_____

N22. How much did (SOURCE) reimburse or pay you back?
ENTER AMOUNT OR PERCENT.

AMT: $ _____.___
OR
PCT: _____%

SOURCE #2

_____

AMT: $ _____.___
OR
PCT: _____%

AMT: $ _____.___ (N19) ..... 95 (FF__; BOX N3, pg.9 ..... -8 (N19)	AMT: $ _____.___ (N19) ..... 95 (FF__; BOX N3, pg.9 ..... -8 (N19)	AMT: $ _____.___ (N19) ..... 95 (FF__; BOX N3, pg.9 ..... -8 (N19)	AMT: $ _____.___ (N19) ..... 95 (FF__; BOX N3, pg.9 ..... -8 (N19)
AMT: $ _____.___ OR PCT: _____% ..... 0 (N24) ..... 1 ..... 2 } (N20) ..... -8	AMT: $ _____.___ OR PCT: _____% ..... 0 (N24) ..... 1 ..... 2 } (N20) ..... -8	AMT: $ _____.___ OR PCT: _____% ..... 0 (N24) ..... 1 ..... 2 } (N20) ..... -8	AMT: $ _____.___ OR PCT: _____% ..... 0 (N24) ..... 1 ..... 2 } (N20) ..... -8
..... 1 (N21) ..... 2 (N23) ..... -8 (N23)	..... 1 (N21) ..... 2 (N23) ..... -8 (N23)	..... 1 (N21) ..... 2 (N23) ..... -8 (N23)	..... 1 (N21) ..... 2 (N23) ..... -8 (N23)
SOURCE #1 _____ AMT: $ _____.___ OR PCT: _____% SOURCE #2 _____ AMT: $ _____.___ OR PCT: _____%	SOURCE #1 _____ AMT: $ _____.___ OR PCT: _____% SOURCE #2 _____ AMT: $ _____.___ OR PCT: _____%	SOURCE #1 _____ AMT: $ _____.___ OR PCT: _____% SOURCE #2 _____ AMT: $ _____.___ OR PCT: _____%	SOURCE #1 _____ AMT: $ _____.___ OR PCT: _____% SOURCE #2 _____ AMT: $ _____.___ OR PCT: _____%

N23. Do you <u>expect</u> any (other) source to reimburse you for what you paid?

Yes	①	 1
No	②	 2

BOX N2	HAS TOTAL CHARGE BEEN PAID ("TOTAL CHARGE WAS PAID" CODED IN N19)?	
	YES ①	..... 1 BOX N3, pg.9
	NO ②	..... 2 (N24)

N24. Do you (or anyone in the family) expect to pay any (additional) amount for this prescription?

Yes ①	 1
No ②	 2

N25. Have any (other) sources <u>already</u> paid any of the charges for this prescription?

Yes ①	..... 1 (N26)
No ②	..... 2 (N28)
DON'T KNOW -8	..... -8 (N28)

N26. Who (else) paid?
RECORD SOURCE, THEN PROBE:
Anyone else?

SOURCE #1

_____

N27. How much did (SOURCE) pay?
ENTER AMOUNT OR PERCENT.

AMT: $ _____.____
OR
PCT: _____%

SOURCE #2

_____

AMT: $ _____.____
OR
PCT: _____%

..... 1 2	..... 1 2	..... 1 2	..... 1 2
..... 1 BOX N3, pg.9 ..... 2 (N24)	..... 1 BOX N3, pg.9 ..... 2 (N24)	..... 1 BOX N3, pg.9 ..... 2 (N24)	..... 1 BOX N3, pg.9 ..... 2 (N24)
..... 1 2	..... 1 2	..... 1 2	..... 1 2
..... 1 (N26) ..... 2 (N28) ..... -8 (N28)	..... 1 (N26) ..... 2 (N28) ..... -8 (N28)	..... 1 (N26) ..... 2 (N28) ..... -8 (N28)	..... 1 (N26) ..... 2 (N28) ..... -8 (N28)
SOURCE #1 _____ AMT: $ _____.____ OR PCT: _____%	SOURCE #1 _____ AMT: $ _____.____ OR PCT: _____%	SOURCE #1 _____ AMT: $ _____.____ OR PCT: _____%	SOURCE #1 _____ AMT: $ _____.____ OR PCT: _____%
SOURCE #2 _____ AMT: $ _____.____ OR PCT: _____%	SOURCE #2 _____ AMT: $ _____.____ OR PCT: _____%	SOURCE #2 _____ AMT: $ _____.____ OR PCT: _____%	SOURCE #2 _____ AMT: $ _____.____ OR PCT: _____%

N28. Do you expect anyone else to pay any of the charges for this prescription? Yes ..... ① No ..... ②	 ..... 1 BOX N3 ..... 2 BOX N3
N29. Do you know what the total charge was for this prescription? Yes ..... ① No ..... ②	 ..... 1 (N30) ..... 2 BOX N3
N30. Including any amounts that may be paid by health insurance, Medicare, Medicaid, or other sources, how much was the total charge for this prescription? INCLUDED WITH OTHER CHARGES ..... (95)	 AMT: $ _____.___ BOX N3 ..... 95 (FF__; BOX N3
N31. Did you (or anyone in the family) pay anything for this prescription? Yes ..... ① No ..... ②	 ..... 1 (N32) ..... 2 BOX N3
N32. How much did you (or anyone in the family) pay?	 AMT: $ _____.___

BOX N3	ASK N10 THROUGH N32 FOR NEXT MEDICINE; IF NO OTHER MEDICINE, CONTINUE WITH SECTION P, "OTHER MEDICAL EXPENSES," PG. 39 IN THE CENTRAL QUESTIONNAIRE.

d. Other Medical Expenses Booklet

VIOLET

OMB #: [illegible]
Expires: [illegible]

RU ID #: _____

BOOKLET # _____ OF _____ BOOKLETS

ROUND NUMBER: 1 2 3 -

DATE OF INTERVIEW: ____/____/____

Department of Health and Human Services
National Center for Health Services Research
and Health Care Technology Assessment

and

Health Care Financing Administration

NATIONAL MEDICAL EXPENDITURE SURVEY

HOUSEHOLD SURVEY AND
SURVEY OF AMERICAN INDIANS AND ALASKA NATIVES

MAIN SURVEY

P. OTHER MEDICAL EXPENSES BOOKLET

ASSURANCE OF CONFIDENTIALITY

Information contained on this form which would permit identification of any individual or establishment has been collected with a guarantee that it will be held in strict confidence by the contractor and NCHSR, will be used only for purposes stated in this study, and will not be disclosed or released to anyone other than authorized staff of NCHSR without the consent of the individual or the establishment in accordance with Section 308(d) of the Public Health Service Act (42 U.S.C. 242m).

PRESCRIBED MEDICINE PROBES

Now I'd like to ask about prescribed medicines.

N1. Since (REF. DATE) did you (or anyone in the family) have any prescriptions refilled?

Yes. 1 (N2)
No 2 (N4)

N2. For whom was this prescription refilled?
PROBE: Was medicine refilled for anyone else?
RECORD PERSON NAME AND NUMBER IN PRESCRIBED MEDICINES ROSTER. USE A SEPARATE LINE FOR EACH PERSON.

N3. FOR EACH PERSON MENTIONED IN N2: What is the name of the medicine refilled for (PERSON)?
PROBE: Were any other medicines refilled for (PERSON) since (REF. DATE)?
RECORD NAME OF MEDICINE IN PRESCRIBED MEDICINES ROSTER. USE A SEPARATE ROW FOR EACH PERSON/MEDICINE COMBINATION.

N4. (Not counting the medicines you just told me about,) Since (REF. DATE) did you (or anyone in the family) buy or obtain any kind of medicine prescribed by a doctor?

Yes. 1 (N5)
No 2 (N7)

N5. For whom was this medicine bought?
PROBE: Was medicine bought for anyone else?
RECORD PERSON NAME AND NUMBER IN PRESCRIBED MEDICINES ROSTER.

N6. FOR EACH PERSON MENTIONED IN N5: What is the name of the medicine purchased for (PERSON)?
PROBE: Were any other medicines purchased for (PERSON) since (REF. DATE)?
RECORD NAME OF MEDICINE IN PRESCRIBED MEDICINES ROSTER. USE A SEPARATE ROW FOR EACH PERSON/MEDICINE COMBINATION.

N7. (Not counting the medicines you just told me about,) Since (REF. DATE) did you (or anyone in the family) get any medicine prescribed by a doctor in a telephone call to the pharmacist or drug store?

Yes 1 (N8)
No . . . . . 2 BOX N1

N8. For whom was medicine prescribed by telephone?
PROBE: Was medicine prescribed by telephone for anyone else?
RECORD PERSON NAME AND NUMBER IN PRESCRIBED MEDICINES ROSTER.

N9. FOR EACH PERSON MENTIONED IN N8: What is the name of the medicine prescribed for (PERSON)?
PROBE: Were any other medicines prescribed for (PERSON) since (REF. DATE)?
RECORD NAME OF MEDICINE IN PRESCRIBED MEDICINES ROSTER. USE A SEPARATE ROW FOR EACH PERSON/MEDICINE COMBINATION.

BOX N1	REVIEW PRESCRIBED MEDICINES ROSTER: ARE ANY MEDICINES LISTED? YES . . . . . 1 (TRANSFER INFORMATION FROM ROSTER TO PRESCRIBED MEDICINES BOOKLET — DARK BLUE. USE SEPARATE COLUMN FOR EACH PERSON/MEDICINE COMBINATION. CONTINUE WITH N10 IN PRESCRIBED MEDICINE BOOKLET.) NO. . . . . 2 (CONTINUE WITH NEXT CENTRAL SECTION, "OTHER MEDICAL EXPENSES.")

TECHNICAL APPENDIX J: DATA UNDERLYING THE ESTIMATION OF INDUCED DEMAND FOR THE MEDICARE POPULATION: MEDCO BENEFICIARIES

MEDCO CONTAINMENT SERVICES, Inc.
1900 Pollitt Drive, Fair Lawn, NJ 07410 (201) 794-7000

March 30, 1989

Donald E. Goldstone, M.D.
Director, Division of Intramural Research
National Center for Health Services Research
Park Building
Room 3-30
5600 Fishers Lane
Rockville, MD 20857

Dear Dr. Goldstone:

A few months ago I had the pleasure to meet with you and your staff to discuss the National Medical Expenditure Survey and its use in predicting per capita drug costs for the Medicare-eligible population. At that time we discussed whether Medco could access its database to provide insight into the drug expenditures for Medicare-eligibles who possessed first-dollar medical and outpatient drug coverage. Since our meeting, our staffs have worked closely to develop the data parameters that would make our data most useful to your study.

Permit me to briefly describe how we gathered our data for this study. Medco administers prescription drug benefits through plastic card programs through our subsidiary PAID Prescriptions, Inc. In 1988, PAID processed nearly 35 million drug claims. In addition, through our mail service pharmacy subsidiaries ("National Pharmacies"), Medco operates eight mail service pharmacies which provide maintenance medications to individuals covered by funded benefits programs. In 1988, National Pharmacies dispensed nearly 14 million prescriptions. The data we have provided are for selected groups with "integrated" drug benefits; i.e., patients may obtain their prescription drugs from either retail pharmacies or our mail service pharmacies.

The sample we selected covers nearly 125,000 individual Medicare-eligibles. Our sample was not intended to be representative of our entire book of business; rather, the sample was drawn from plans with first dollar coverage, i.e., no deductible was applicable, and patient copayments were $2 or less. We sought to identify groups which were comparatively high users of their prescription drug benefits compared to the majority of plans we administer. Our goal, simply put, was to provide an estimate of the maximum per capita cost Medicare should expect for the outpatient drug benefit under the Medicare Catastrophic Act.

Our data show that in our sample, biased toward high utilizing groups with first dollar coverage, 19% would exceed $600 in expenditures in CY 1987. Adjusting this forward to 1991, when the outpatient drug benefit becomes effective, approximately 35% would have expenditures in excess of $600, assuming a 15% annual trend rate. We have provided comparable projections for other annual trend rates.

Our data are <u>not</u> an accurate predictor for the level of expenditures Medicare can expect under the outpatient drug benefit. We would like to draw attention to a few significant caveats which are applicable to our study:

1. Our sample is not a national sample; rather, it was drawn from high utilizing groups specifically to provide an upper-end estimate of per capita cost;

2. Our data report expenditures under first dollar coverage programs, not the $600 deductible, 50% coinsurance applicable in 1991 under Medicare; and

3. The use of generic drugs in the sample population ranged from approximately 18% in retail pharmacies to 25% in our mail service pharmacies. The Medicare Catastrophic Act will likely experience a higher generic substitution rate because of the Act's requirement that the physician write, in his or her own hand, "brand medically necessary."

On behalf of Medco, I am pleased we were able to assist the Center in conducting this analysis. We hope that the data in our study can assist you, and ultimately the Congress, in evaluating the "induced demand" phenomenon which caused such a wide variance in cost predictions for the benefit. We appreciate the opportunity to have been part of the process. If you have any questions concerning our data, please don't hesitate to contact me. Good luck in your evaluation of the NMES data.

Sincerely,

Terry S. Latanich
Senior Vice President
for Government Relations

Enclosures

I. Source of Data

The data used in the accompanying analysis were obtained from two sources:

A. Prescription drug claims filed by retail pharmacies

These claims were incurred by beneficiaries of group drug programs administered by PAID Prescriptions Inc., a wholly owned subsidiary of Medco Containment Services, Inc. Beneficiaries under benefit plans administered by PAID Prescriptions are issued plastic cards which are accepted in lieu of payment for items covered under the groups' plans at over 54,000 participating pharmacies throughout the United States. If beneficiaries forget their cards or obtain medications through non-participating pharmacies, they may submit a direct claim form for reimbursement.

B. Mail service prescription drug data

These data resulted from the dispensing of prescription drugs via mail service by National Rx Services, Inc. and affiliates (hereinafter collectively referred to as "National Pharmacies") which are wholly owned subsidiaries of Medco Containment Services, Inc. Beneficiaries prescribed maintenance medications are afforded the option of receiving their medications through the mail, in generally greater quantity than would be dispensed at a retail pharmacy. Beneficiaries send either their prescriptions or refill slips to National Pharmacies where they are screened, checked for drug interactions, dispensed, and mailed in approximately 48 hours from the time they are received.

Beneficiaries become entitled to both the plastic card and mail service prescription drug benefits through their employment as a component of their total health benefits package.

II. General Information

A. The groups used in the study consist of 123,558 active and retired eligibles of which 100,815 used their drug benefit in 1987.

B. All eligibles were 65 years or older as of January 1, 1987.

II. General Information (Cont.)

C. The group consists of both white and blue collar workers.

D. Compared to other Medco clients with similar demographics, the study group as a whole exhibits a higher utilization rate for prescription drugs.

E. All eligibles in the study, including those who used the drug benefit, were eligible for the entire calendar year 1987. Eligibility information and claims data for those individuals who were eligible for only part of 1987 were excluded.

F. All information provided in the accompanying analyses is based on individual, as opposed to family or subscriber data.

G. Data from both PAID Prescriptions and National Pharmacies are for drugs dispensed in calendar year 1987.

H. Data obtained from PAID Prescriptions was collected from claim payment cycles through June of 1988 to account for claim run out.

III. Prescription Statistics

A. The generic dispensing rate, based on the number of prescriptions dispensed, was 18% for PAID Prescriptions' claims. This figure is slightly higher than the 15% generic rate seen for all groups administered by PAID over the same period.

B. The generic dispensing rate for prescriptions dispensed by National Pharmacies was 25% as compared to 23% for all of National's mail service clients for the same period.

III. Prescription Statistics (Cont.)

C. The average number of days supplied per prescription in the groups studied was 28 days for PAID Prescriptions' claims versus a 22 day average for all PAID groups.

D. The average number of days supplied for mail service claims was 105 compared to a 68 day average for all National Pharmacies mail service claims.

E. There were 2,063,809 prescriptions included in the study. 95% of the prescriptions were purchased through the PAID Prescriptions pharmacy network. The remaining 5% were dispensed by National Pharmacies

F. The 2,063,809 prescriptions represent 66,094,644 therapy days. 83% of the therapy days were from the PAID Prescriptions pharmacy network, 17% were from prescriptions dispensed by National Pharmacies.

IV. Plan Information

A. Drugs Covered

1. Federal Legend Drugs - any medicinal substance which bears the legend "Caution: Federal Law prohibits dispensing without a prescription."

2. State Restricted Drugs - any medicinal substance which may be dispensed by prescription only, according to State Law.

3. Compounded Medications - any extemporaneously prepared dosage form.

4. Insulin

5. Gamma Globulin

B. Exclusions

1. Any vitamin preparations, even though a prescription is required for their dispensing except: Rocaltrol, Calderol, Hytakerol, and DHT

2. Diaphrams, contraceptive jellies, ointments, and foams, or devices, and oral contraceptives regardless of the reason prescribed.

3. Immunization agents, biological sera, blood, and blood plasma.

4. Non-Federal Legend Drugs

5. Drugs Labeled "Caution - limited by Federal law to investigational use", or experimental drugs.

6. Any charge for the administration of prescription legend drugs or injectable insulin.

7. Medication which is to be taken or administered to the individual, in whole or in part, while he or she is a patient in a licensed hospital, rest home, sanitarium, extended care facility, convalescent hospital, nursing home, or similar institution which operates on its premises, or allows to be operated on its premises, a facility for dispensing pharmaceuticals.

8. Medication covered by Workers' Compensation or Occupational Disease Law, or any state or governmental agency.

C. Pricing

1. The reimbursement formula to pharmacies which accept the PAID Prescriptions card varies from Average Wholesale Price (AWP) plus a dispensing fee to AWP minus five percent (5%) plus a dispensing fee.

2. The pricing on prescriptions dispensed through National Pharmacies for these groups is approximately AWP minus twelve percent (12%) plus a dispensing fee, to AWP minus thirteen percent (13%) plus a dispensing fee.

D. Copayment

The per prescription copayment for the study group ranged from zero ($0.00) to two dollars ($2.00)

V. Exhibits

Table 1: PER ELIGIBLE PER YEAR MEAN AND STANDARD DEVIATIONS

For each individual in the study the number of prescriptions, amount of charges, amount of copayments, and amount of net payments were calculated for prescriptions dispensed in 1987. Both the mean and standard deviation were calculated in each case using the number of eligibles as "n". The resulting means and standard deviations were then arrayed according to age and sex.

A. The ages were calculated as of January 1, 1987.

B. Eligibles must have been eligible the entire year of 1987 to be included.

C. The number of claims is the number of prescriptions dispensed per eligible. Since mail service prescriptions have on average 3.75 times more days supplied per prescription, the number of mail service prescriptions were multiplied by 3.75 to be on a consistent basis with the PAID Prescriptions data.

D. The amount of charges consist of the total annual ingredient cost less applicable discounts plus dispensing fee.

E. Copayments are total annual per prescription contributions made by beneficiaries.

F. Payments are the total annual charges less the total annual copayments.

Table 2: PER USER PER YEAR MEAN AND STANDARD DEVIATIONS

The same as Table 1 with the exception that means and standard deviations were calculated using the number of users as "n". A user is any individual that was eligible for the entire year of 1987 and had at least one prescription dispensed during 1987.

Table 3: NUMBER OF USERS AS A PERCENT OF NUMBER OF ELIGIBLES

The number of users arrayed by age and sex were divided by the number of eligibles in each age/sex cell to yield participation rates by age/sex.

Table 4: CUMULATIVE CLAIMS ANALYSIS - ELIGIBLES

The individual annual data is arrayed according to the amount of charges for each user. Cumulative percentile ranking is provided for number of eligibles, amount of charges, and number of prescriptions. Statistics for average charge per prescription and average number of prescriptions per user are also provided.

A. The number of eligibles column provides the number of users that fall into the respective range of annual charges. In addition, the number of non-users are accounted for in the $0.00 to $5.00 range at the bottom of Page 3.

B. The cumulative percent of eligibles represents the percent of eligibles that fall at or below the given range of annual charges.

C. Ingredient cost is the total annual ingredient cost less applicable discount for all individuals that fall in each range of annual charges.

D. Dispensing fee is the total annual dispensing fees for all individuals that fall into each range of annual charges.

E. The amount of charges is the sum of the total annual ingredient cost and total annual dispensing fees for all individuals that fall into each range of annual charges.

F. The cumulative amount of charges represents the percent of charges that fall at or below the given range of annual charges.

G. Copay is the total annual per prescription copayments made by users that fall into each range of annual charges.

H. Net Check is the total annual amount of charges less the total annual copayments that fall into each range of annual charges.

I. Number of prescriptions is the actual number of prescriptions dispensed for each range of annual charges. Unlike the number of prescriptions in Tables 2 and 3, here the figures are unadjusted for the day supply differential noted earlier.

J. The cumulative percent of prescriptions represents the percent of prescriptions that fall at or below the given range of annual charges.

Table 4: CUMULATIVE CLAIMS ANALYSIS - ELIGIBLES (Cont.)

K. Charges per prescription is the amount of charges divided by the number of prescriptions that fall into each range of annual charges.

L. Prescriptions per user is the number of prescriptions divided by the number of users that fall into each range of annual charges.

In the $ 580.01 to $ 600.00 range located on Page 2, it can be seen that just over 80% of the eligibles fall below this range. Conversely, 19.78% of all eligibles fall above this level in 1987.

Table 5: CUMULATIVE CLAIMS ANALYSIS - USERS

Table 4 is the same as Table 3 with the exception that non-users were not included in the $ 0.00 to $ 5.00 range. This effectively changes the cumulative number of eligibles into the cumulative number of users.

Table 6: ESTIMATED 1991 PER ELIGIBLE ANNUAL CHARGES

The amount of charges column was taken from Table 4 and divided by the number of eligibles for each range of charges. The result was an average annual charge for each range. This average annual charge was then trended forward, at various annual trend rates, for 4 years to estimate 1991 experience.

With regard to the highlighted areas on Page 3, it can be seen that 70.43% of eligibles will fall below the $ 600.00 range assuming an annual trend rate of 10%. Conversely, 29.59% of eligibles will fall above the $ 600.00 range. At the 20% trend rate approximately 39% of eligibles will fall above the $ 600.00 range.

With regard to the highlighted areas on Page 2, it can be seen that a $ 981.00 to $ 1,389.00 deductible would be dictated in order to maintain 16.63% of eligibles above the $ 600.00 level for annual trend rates of 10% to 20% respectively.

AGE		# ELIGIBLES		# CLAIMS				AMOUNT OF CHARGES				COPAYMENT				PAYMENTS			
				MALE		FEMALE		MALE		FEMALE		MALE		FEMALE		MALE		FEMALE	
FR	TO	MALE	FEMALE	MEAN	STD DEV	MEAN	STD DEV	MEAN	STD DEV	MEAN	STD DEV	MEAN	STD DEV	MEAN	STD DEV	MEAN	STD DEV	MEAN	STD DEV
65	65.99	4,649	5,733	15.91	20.266	16.70	19.732	311.50	448.085	308.09	412.238	23.04	30.404	25.67	32.615	288.51	425.009	282.46	384.776
66	66.99	4,468	5,564	16.87	21.220	17.21	19.810	325.49	433.721	311.14	406.987	24.68	32.378	25.94	31.967	300.88	407.797	285.24	380.339
67	67.99	3,904	5,015	16.69	21.249	18.29	20.943	327.08	467.832	335.78	433.468	24.03	32.063	27.84	33.752	303.08	442.612	308.00	405.664
68	68.99	4,124	5,202	17.80	21.751	18.40	20.910	335.38	432.250	330.78	404.893	25.50	31.517	27.92	32.568	309.96	407.668	302.90	378.076
69	69.99	3,841	4,995	17.89	20.947	18.72	21.740	344.55	447.324	338.02	427.372	25.62	31.898	28.19	33.728	318.96	422.122	309.87	399.400
70	70.99	3,481	4,526	18.61	21.615	18.76	20.818	357.71	442.648	341.81	418.609	27.00	33.064	29.19	34.183	330.75	416.202	312.67	389.893
71	71.99	3,486	4,407	18.68	22.093	19.34	20.949	345.34	433.682	344.34	412.627	26.69	33.453	29.28	32.736	318.72	406.961	315.09	385.660
72	72.99	3,316	4,116	19.09	21.381	19.40	20.163	357.64	432.467	348.23	398.413	28.06	32.780	29.84	32.810	329.64	406.253	318.44	371.873
73	73.99	2,878	3,757	20.04	22.428	20.16	21.024	366.60	466.596	356.31	423.223	28.61	34.507	30.99	33.789	338.04	440.557	325.38	396.214
74	74.99	2,709	3,534	19.48	21.785	20.11	21.748	352.27	406.565	354.32	407.564	27.87	31.968	30.92	33.908	324.45	380.908	323.45	380.002
75	75.99	2,335	3,117	21.03	22.463	22.12	23.854	375.40	424.613	384.23	434.360	29.90	34.410	33.98	36.805	345.53	397.248	350.30	403.842
76	76.99	2,186	2,937	20.60	22.744	21.23	21.039	373.85	430.925	371.72	402.516	29.56	33.742	32.88	34.576	344.34	404.139	338.90	373.975
77	77.99	2,037	2,642	20.87	22.105	21.63	22.691	376.12	412.592	372.68	413.639	29.98	33.027	33.26	35.208	346.22	386.616	339.48	385.099
78	78.99	1,828	2,446	21.09	22.037	21.94	21.263	375.66	441.476	382.00	428.248	30.72	33.734	34.51	35.933	344.98	415.428	347.58	398.525
79	79.99	1,551	2,128	21.65	23.372	21.54	21.732	378.10	421.892	379.10	413.530	32.00	34.736	34.18	35.843	346.14	393.758	344.99	383.593
80	80.99	1,183	1,770	21.11	22.445	22.79	23.359	376.44	423.889	398.78	458.276	30.91	34.476	35.88	38.258	345.57	395.421	362.97	425.962
81	81.99	1,044	1,464	22.06	23.011	22.77	22.068	388.67	451.298	379.75	407.168	34.03	38.546	35.81	36.040	354.73	419.386	344.00	377.099
82	82.99	839	1,273	21.23	21.164	22.88	22.884	362.71	389.758	376.94	415.209	31.75	34.102	35.56	36.132	331.03	361.677	341.47	385.851
83	83.99	672	1,045	22.11	23.764	23.82	24.200	361.20	421.128	391.04	424.889	33.08	37.120	37.95	40.604	328.15	392.202	353.15	391.045
84	84.99	586	806	20.99	23.112	22.58	22.383	365.43	447.437	371.03	396.991	33.83	40.416	36.86	37.914	331.69	411.165	334.23	364.990
85	85.99	409	684	21.06	19.367	19.82	19.248	350.17	377.409	314.08	324.642	32.15	33.093	31.53	31.418	318.06	351.561	282.62	298.942
86	98.99	891	1,747	20.21	20.316	20.59	22.383	326.75	384.482	309.13	379.755	32.21	35.752	33.25	38.450	294.60	353.451	275.93	347.403
99		315	918	18.48	17.926	14.69	19.992	332.61	382.451	236.57	344.643	28.37	28.857	23.24	31.324	304.29	360.931	213.36	318.451
TOTALS		52,732	69,826	18.97		19.82		351.31		349.97		27.58		30.56		323.79		319.46	

AGE		# USERS		# CLAIMS				AMOUNT OF CHARGES				COPAYMENT				PAYMENTS			
				MALE		FEMALE		MALE		FEMALE		MALE		FEMALE		MALE		FEMALE	
FR	TO	MALE	FEMALE	MEAN	STD DEV	MEAN	STD DEV	MEAN	STD DEV	MEAN	STD DEV	MEAN	STD DEV	MEAN	STD DEV	MEAN	STD DEV	MEAN	STD DEV
65	65.99	3,691	4,709	20.04	22.366	20.33	21.467	392.36	496.342	375.08	449.897	29.02	33.595	31.26	35.551	363.39	471.072	343.88	420.090
66	66.99	3,548	4,546	21.25	23.408	21.06	21.575	409.89	479.342	380.81	444.833	31.08	35.767	31.74	34.886	378.89	450.925	349.12	415.898
67	67.99	3,103	4,172	21.00	23.440	21.98	22.663	411.51	517.915	403.62	470.381	30.23	35.425	33.47	36.575	381.32	490.259	370.24	440.387
68	68.99	3,322	4,323	22.09	23.852	22.14	22.630	416.35	474.753	398.04	439.032	31.65	34.573	33.60	35.272	384.79	448.013	364.49	410.136
69	69.99	3,116	4,194	22.05	22.881	22.29	23.455	424.72	490.132	402.57	461.912	31.58	34.909	33.58	36.412	393.17	462.751	369.05	431.839
70	70.99	2,822	3,789	22.96	23.609	22.41	22.458	441.24	484.475	408.30	452.656	33.31	36.177	34.86	36.926	407.99	455.752	373.49	421.766
71	71.99	2,826	3,722	23.05	24.146	22.90	22.517	426.00	474.868	407.70	444.500	32.92	36.628	34.67	35.211	393.15	445.822	373.08	415.624
72	72.99	2,700	3,479	23.45	23.290	22.95	21.642	439.24	472.271	411.99	428.639	34.46	35.758	35.31	35.266	404.84	443.891	376.75	400.263
73	73.99	2,389	3,212	24.14	24.272	23.58	22.479	441.63	506.602	416.76	453.714	34.47	37.418	36.25	36.164	407.23	478.571	380.59	424.940
74	74.99	2,245	2,969	23.51	23.590	23.94	23.415	425.07	440.634	421.75	439.513	33.63	34.642	36.81	36.522	391.51	413.016	385.00	409.990
75	75.99	1,956	2,631	25.10	24.203	26.20	25.641	448.14	458.194	455.20	467.421	35.70	37.147	40.26	39.565	412.49	428.836	415.00	434.773
76	76.99	1,814	2,495	24.83	24.606	25.00	22.514	450.52	466.796	437.58	431.723	35.63	36.540	38.70	37.060	414.95	437.990	398.94	401.284
77	77.99	1,725	2,229	24.64	23.723	25.63	24.378	444.15	443.163	441.73	445.007	35.41	35.477	39.42	37.833	408.84	415.434	402.38	414.516
78	78.99	1,553	2,066	24.82	23.615	25.98	22.781	442.18	474.329	452.25	460.644	36.16	36.192	40.86	38.579	406.07	446.552	411.48	428.892
79	79.99	1,295	1,781	25.93	25.217	25.74	23.380	452.84	455.624	452.97	445.947	38.32	37.485	40.84	38.609	414.57	425.456	412.20	413.878
80	80.99	1,015	1,472	24.60	23.978	27.40	25.197	438.74	453.366	479.52	495.999	36.03	36.866	43.14	41.319	402.77	423.044	436.45	461.277
81	81.99	877	1,199	26.26	24.753	27.80	23.860	462.69	486.801	463.68	442.022	40.51	41.553	43.72	39.030	422.28	452.564	420.03	409.698
82	82.99	712	1,049	25.02	22.659	27.77	24.730	427.40	418.117	457.43	450.259	37.41	36.584	43.16	39.071	390.08	388.145	414.39	418.755
83	83.99	535	852	27.78	26.023	29.21	26.254	453.69	462.827	479.63	462.145	41.55	40.731	46.55	44.138	412.18	431.454	433.15	425.625
84	84.99	474	653	25.95	25.216	27.87	24.298	451.78	489.946	457.96	432.403	41.82	44.221	45.49	41.229	410.06	450.401	412.54	397.868
85	85.99	343	524	25.11	20.756	25.87	21.143	417.55	406.577	409.98	358.294	38.34	35.603	41.15	34.582	379.27	378.987	368.92	330.463
86	98.99	680	1,229	26.48	22.393	29.27	25.236	428.14	428.271	439.42	433.617	42.20	39.685	47.27	43.647	386.01	394.127	392.22	397.533
99		238	542	24.46	19.735	24.89	24.017	440.21	426.628	400.68	418.610	37.55	31.904	39.37	37.598	402.74	403.391	361.37	388.122
TOTALS		42,979	57,837	23.27		23.84		430.85		420.90		33.82		36.76		397.09		384.21	

TABLE 3 – NUMBER OF USERS AS A PERCENTAGE OF NUMBER OF ELIGIBLES

AGE				
FROM	TO	MALE	FEMALE	TOTAL
65	65.99	79.39%	82.14%	80.91%
66	66.99	79.41%	81.70%	80.68%
67	67.99	79.48%	83.19%	81.57%
68	68.99	80.55%	83.10%	81.98%
69	69.99	81.12%	83.96%	82.73%
70	70.99	81.07%	83.72%	82.57%
71	71.99	81.07%	84.46%	82.96%
72	72.99	81.42%	84.52%	83.14%
73	73.99	83.01%	85.49%	84.42%
74	74.99	82.87%	84.01%	83.52%
75	75.99	83.77%	84.41%	84.13%
76	76.99	82.98%	84.95%	84.11%
77	77.99	84.68%	84.37%	84.51%
78	78.99	84.96%	84.46%	84.67%
79	79.99	83.49%	83.69%	83.61%
80	80.99	85.80%	83.16%	84.22%
81	81.99	84.00%	81.90%	82.78%
82	82.99	84.86%	82.40%	83.38%
83	83.99	79.61%	81.53%	80.78%
84	84.99	80.89%	81.02%	80.96%
85	85.99	83.86%	76.61%	79.32%
86	98.99	76.32%	70.35%	72.37%
99		75.56%	59.04%	63.26%
	TOTAL	81.54%	83.15%	82.45%

RANGE OF CHARGES FROM	RANGE OF CHARGES TO	NUMBER OF ELIGIBLES	CUMULATIVE PERCENT OF ELIGIBLES	INGREDIENT COST	DISPENSING FEE	AMOUNT OF CHARGES	CUMULATIVE PERCENT OF CHARGES	COPAY AMOUNT	NET CHECK AMOUNT	NUMBER OF RX'S	CUMULATIVE PERCENT OF RX'S	AMOUNT OF CHARGES PER RX	NUMBER OF RX'S PER USER
40,000.01	UP		100.000%	0.00	0.00	0.00	100.000%	0.00	0.00		100.000%	0.00	0.00
30,000.01	40,000.00		100.000%	0.00	0.00	0.00	100.000%	0.00	0.00		100.000%	0.00	0.00
20,000.01	30,000.00		100.000%	0.00	0.00	0.00	100.000%	0.00	0.00		100.000%	0.00	0.00
10,000.01	20,000.00	1	100.000%	11,771.02	59.50	11,830.52	100.000%	39.00	11,791.52	20	100.000%	591.53	20.00
9,000.01	10,000.00	2	99.999%	18,032.00	331.45	18,363.45	99.972%	175.00	18,188.45	118	99.999%	155.62	59.00
8,000.01	9,000.00		99.998%	0.00	0.00	0.00	99.929%	0.00	0.00		99.993%	0.00	0.00
7,000.01	8,000.00	1	99.998%	6,558.80	495.00	7,053.80	99.929%	360.00	6,693.80	180	99.993%	39.19	180.00
6,000.01	7,000.00	2	99.997%	12,389.25	1,259.50	13,648.75	99.912%	848.00	12,800.75	425	99.985%	32.11	212.50
5,000.01	6,000.00	9	99.995%	45,546.85	3,301.45	48,848.30	99.880%	2,151.00	46,706.93	1,154	99.964%	42.33	128.22
4,000.01	5,000.00	30	99.988%	118,868.09	9,666.75	128,534.84	99.765%	6,135.00	122,405.62	3,368	99.908%	38.16	112.27
3,000.01	4,000.00	168	99.963%	515,066.77	51,603.65	566,670.42	99.463%	32,906.00	533,959.62	17,960	99.745%	31.55	106.90
2,950.01	3,000.00	17	99.826%	45,912.65	4,682.70	50,595.35	98.131%	2,962.00	47,633.35	1,654	98.875%	30.59	97.29
2,900.01	2,950.00	19	99.812%	50,428.73	5,238.65	55,667.38	98.012%	3,368.00	52,320.26	1,857	98.795%	29.98	97.74
2,850.01	2,900.00	18	99.797%	46,387.16	5,307.55	51,694.71	97.881%	3,355.00	48,356.32	1,867	98.705%	27.69	103.72
2,800.01	2,850.00	23	99.782%	58,300.34	6,680.00	64,980.34	97.759%	4,172.00	60,819.29	2,300	98.614%	28.25	100.00
2,750.01	2,800.00	26	99.763%	65,275.70	6,846.80	72,122.50	97.607%	4,419.00	67,711.84	2,380	98.503%	30.30	91.54
2,700.01	2,750.00	22	99.742%	54,316.01	5,667.50	59,983.51	97.437%	3,517.00	56,474.48	1,936	98.387%	30.98	88.00
2,650.01	2,700.00	28	99.724%	67,203.42	7,657.55	74,860.97	97.296%	4,720.00	70,146.73	2,668	98.293%	28.06	95.29
2,600.01	2,650.00	33	99.701%	78,155.58	8,544.05	86,699.63	97.120%	5,238.00	81,464.44	3,023	98.164%	28.68	91.61
2,550.01	2,600.00	31	99.674%	70,877.02	8,928.25	79,805.27	96.916%	5,637.00	74,178.21	3,116	98.018%	25.61	100.52
2,250.01	2,550.00	36	99.649%	81,620.41	9,235.40	90,855.81	96.729%	6,036.00	84,821.35	3,205	97.867%	28.35	89.03
2,450.01	2,500.00	50	99.620%	111,892.37	11,994.05	123,886.42	96.515%	7,390.00	116,501.02	4,172	97.711%	29.69	83.44
2,400.01	2,450.00	51	99.579%	111,368.47	12,279.75	123,648.22	96.224%	7,482.00	116,190.86	4,313	97.509%	28.67	84.57
2,350.01	2,400.00	50	99.537%	106,312.72	12,500.60	118,813.32	95.933%	7,961.00	110,854.83	4,363	97.300%	27.23	87.26
2,300.01	2,350.00	58	99.497%	119,946.52	14,687.55	134,634.07	95.653%	9,238.00	125,398.40	5,091	97.089%	26.45	87.78
2,250.01	2,300.00	57	99.449%	117,520.58	12,078.65	129,599.23	95.337%	7,511.00	122,107.75	4,235	96.842%	30.60	74.30
2,200.01	2,250.00	72	99.403%	143,158.60	17,077.40	160,236.00	95.032%	10,516.00	149,726.76	5,930	96.637%	27.02	82.36
2,150.01	2,200.00	87	99.344%	170,423.21	18,974.10	189,397.31	94.655%	11,593.00	177,812.75	6,605	96.350%	28.67	75.92
2,100.01	2,150.00	92	99.273%	173,820.11	21,753.85	195,573.96	94.210%	13,414.00	182,160.71	7,518	96.030%	26.01	81.72
2,050.01	2,100.00	105	99.198%	194,360.83	23,333.40	217,694.23	93.750%	14,788.00	202,931.99	8,166	95.665%	26.66	77.77
2,000.01	2,050.00	143	99.112%	257,476.03	31,899.85	289,375.88	93.238%	20,168.00	269,232.64	11,165	95.270%	25.92	78.08
1,950.01	2,000.00	133	98.996%	234,328.50	28,571.10	262,899.60	92.558%	17,712.00	245,199.72	9,965	94.729%	26.38	74.92
1,900.01	1,950.00	148	98.887%	254,045.69	30,783.70	284,829.39	91.940%	18,879.00	266,112.96	10,679	94.246%	26.67	72.16
1,850.01	1,900.00	159	98.766%	263,288.70	34,586.35	297,875.05	91.270%	21,823.00	276,093.84	11,925	93.728%	24.98	75.00
1,800.01	1,850.00	182	98.637%	294,887.54	37,293.32	332,180.86	90.570%	22,698.00	309,568.42	12,928	93.151%	25.69	71.03
1,750.01	1,800.00	196	98.488%	308,668.34	38,994.69	347,663.03	89.789%	24,187.00	323,541.95	13,588	92.524%	25.59	69.33
1,700.01	1,750.00	202	98.328%	309,273.94	39,656.40	348,930.34	88.971%	24,850.00	324,098.26	13,784	91.866%	25.31	68.24
1,650.01	1,700.00	248	98.163%	368,565.50	46,455.03	415,020.53	88.151%	28,661.00	386,411.19	16,185	91.198%	25.64	65.26
1,600.01	1,650.00	293	97.961%	423,544.72	52,354.50	475,899.22	87.175%	32,157.00	443,835.99	18,249	90.414%	26.08	62.28
1,550.01	1,600.00	300	97.722%	419,399.95	53,051.89	472,451.84	86.056%	32,749.00	439,798.45	18,439	89.529%	25.62	61.46
1,500.01	1,550.00	382	97.477%	515,745.09	66,030.08	581,775.17	84.945%	40,738.00	541,133.28	23,007	88.636%	25.29	60.23
1,450.01	1,500.00	377	97.165%	491,977.50	63,755.90	555,733.40	83.577%	39,586.00	516,216.47	22,207	87.521%	25.03	58.90
1,400.01	1,450.00	417	96.858%	523,747.44	70,256.19	594,003.63	82.270%	43,718.00	550,417.30	24,394	86.445%	24.35	58.50

RANGE OF CHARGES FROM	TO	NUMBER OF ELIGIBLES	CUMULATIVE PERCENT OF ELIGIBLES	INGREDIENT COST	DISPENSING FEE	AMOUNT OF CHARGES	CUMULATIVE PERCENT OF CHARGES	COPAY AMOUNT	NET CHECK AMOUNT	NUMBER OF RX'S	CUMULATIVE PERCENT OF RX'S	AMOUNT OF CHARGES PER RX	NUMBER OF RX'S PER USER
1,350.01	1,400.00	493	96.518%	597,810.79	79,376.04	677,186.83	80.874%	48,741.00	628,548.10	27,703	85.263%	24.44	56.19
1,300.01	1,350.00	561	96.115%	654,998.66	87,745.46	742,744.12	79.282%	53,539.00	689,282.67	30,608	83.921%	24.27	54.56
1,250.01	1,300.00	592	95.658%	664,609.88	89,785.46	754,395.34	77.535%	55,466.00	699,069.44	31,227	82.438%	24.16	52.75
1,200.01	1,250.00	627	95.175%	675,969.25	91,763.88	767,733.13	75.761%	56,653.00	711,160.39	32,018	80.925%	23.98	51.07
1,150.01	1,200.00	767	94.663%	792,659.37	107,930.76	900,590.13	73.956%	66,448.00	834,289.25	37,577	79.373%	23.97	48.99
1,100.01	1,150.00	854	94.037%	844,232.41	116,432.60	960,665.01	71.839%	71,570.00	889,173.19	40,434	77.553%	23.76	47.35
1,050.01	1,100.00	913	93.340%	860,654.88	120,140.73	980,795.61	69.580%	73,325.00	907,589.86	41,952	75.593%	23.38	45.95
1,000.01	1,050.00	1,054	92.595%	944,104.40	135,790.37	1,079,894.77	67.274%	82,773.00	997,241.39	47,268	73.561%	22.85	44.85
980.01	1,000.00	434	91.735%	375,001.46	54,757.06	429,758.52	64.735%	33,112.00	396,710.22	19,040	71.270%	22.57	43.87
960.01	980.00	477	91.381%	405,510.57	57,238.24	462,748.81	63.724%	35,097.00	427,726.41	20,015	70.348%	23.12	41.96
940.01	960.00	466	90.992%	388,289.16	54,381.43	442,670.59	62.636%	33,021.00	409,688.92	18,988	69.378%	23.31	40.75
920.01	940.00	535	90.612%	437,217.71	60,283.59	497,501.30	61.595%	36,337.00	461,245.47	21,050	68.458%	23.63	39.35
900.01	920.00	593	90.175%	471,033.94	68,557.43	539,591.37	60.425%	41,128.00	498,550.28	23,840	67.438%	22.63	40.20
880.01	900.00	546	89.691%	423,034.06	62,864.74	485,898.80	59.157%	37,610.00	448,380.39	21,987	66.283%	22.10	40.27
860.01	880.00	601	89.246%	455,393.48	67,317.90	522,711.38	58.014%	40,839.00	481,945.90	23,429	65.217%	22.31	38.98
840.01	860.00	608	88.756%	450,096.82	66,537.17	516,633.99	56.785%	40,617.00	476,060.97	23,221	64.082%	22.25	38.19
820.01	840.00	653	88.259%	470,736.55	71,077.35	541,813.90	55.570%	43,033.00	498,802.46	24,733	62.957%	21.91	37.88
800.01	820.00	707	87.727%	498,080.16	74,869.37	572,949.53	54.296%	45,276.00	527,723.40	26,109	61.759%	21.94	36.93
780.01	800.00	698	87.150%	479,729.84	71,923.21	551,653.05	52.949%	43,271.00	508,428.27	25,077	60.494%	22.00	35.93
760.01	780.00	726	86.580%	485,662.20	73,140.09	558,802.29	51.652%	44,168.00	514,749.16	25,494	59.278%	21.92	35.12
740.01	760.00	737	85.988%	479,645.95	73,050.00	552,695.95	50.338%	44,557.00	508,221.49	25,474	58.043%	21.70	34.56
720.01	740.00	739	85.387%	468,073.84	71,539.83	539,613.67	49.039%	43,206.00	496,561.22	24,856	56.809%	21.71	33.63
700.01	720.00	883	84.784%	542,639.50	84,132.90	626,772.40	47.770%	51,078.00	575,796.61	29,328	55.604%	21.37	33.21
680.01	700.00	851	84.063%	508,350.19	78,835.84	587,186.03	46.296%	47,401.00	539,878.91	27,531	54.183%	21.33	32.35
660.01	680.00	910	83.369%	530,164.32	79,591.26	609,755.58	44.915%	47,947.00	561,880.07	27,779	52.849%	21.95	30.53
640.01	660.00	919	82.626%	516,579.81	80,640.55	597,220.36	43.482%	48,896.00	548,419.22	28,164	51.503%	21.21	30.65
620.01	640.00	979	81.876%	532,235.50	84,408.02	616,643.52	42.077%	50,530.00	566,231.13	29,374	50.139%	20.99	30.00
600.01	620.00	1,041	81.078%	548,244.25	86,659.13	634,903.38	40.628%	52,230.00	582,737.28	30,254	48.715%	20.99	29.06
580.01	600.00	1,110	80.228%	565,828.82	89,185.17	655,013.99	39.135%	53,632.00	601,540.64	31,160	47.250%	21.02	28.07
560.01	580.00	1,131	79.322%	554,034.59	90,639.40	644,673.99	37.595%	54,132.00	590,647.76	31,710	45.740%	20.33	28.04
540.01	560.00	1,191	78.400%	561,252.13	93,954.38	655,206.51	36.079%	56,138.00	599,143.45	32,800	44.203%	19.98	27.54
520.01	540.00	1,210	77.428%	549,141.58	91,959.80	641,101.38	34.538%	54,957.00	586,226.92	32,138	42.614%	19.95	26.56
500.01	520.00	1,348	76.441%	587,311.71	99,826.46	687,138.17	33.031%	60,287.00	626,968.00	34,776	41.057%	19.76	25.80
480.01	500.00	1,391	75.341%	580,375.63	101,418.96	681,794.59	31.415%	60,579.00	621,300.13	35,385	39.372%	19.27	25.44
460.01	480.00	1,481	74.206%	593,868.39	102,180.88	696,049.27	29.812%	61,162.00	634,962.28	35,671	37.657%	19.51	24.09
440.01	460.00	1,525	72.997%	583,053.46	102,902.43	685,955.89	28.175%	61,178.00	624,859.81	35,987	35.929%	19.06	23.60
420.01	440.00	1,621	71.753%	591,347.92	105,944.88	697,292.80	26.563%	63,496.00	633,937.51	36,978	34.185%	18.86	22.81
400.01	420.00	1,721	70.430%	596,847.21	108,437.13	705,284.34	24.923%	64,552.00	640,845.54	37,966	32.393%	18.58	22.06
380.01	400.00	1,735	69.026%	573,335.84	103,224.04	676,559.88	23.265%	61,522.00	615,142.82	36,136	30.554%	18.72	20.83
360.01	380.00	1,878	67.610%	587,171.14	107,577.29	694,748.43	21.674%	63,889.00	630,954.16	37,684	28.803%	18.44	20.07
340.01	360.00	1,896	66.078%	557,093.19	106,365.61	663,458.80	20.040%	63,213.00	600,342.55	37,144	26.977%	17.86	19.59
320.01	340.00	1,979	64.531%	547,096.35	105,871.61	652,967.96	18.480%	62,680.00	590,349.21	36,982	25.177%	17.66	18.69

RANGE OF CHARGES FROM	TO	NUMBER OF ELIGIBLES	CUMULATIVE PERCENT OF ELIGIBLES	INGREDIENT COST	DISPENSING FEE	AMOUNT OF CHARGES	CUMULATIVE PERCENT OF CHARGES	COPAY AMOUNT	NET CHECK AMOUNT	NUMBER OF RX'S	CUMULATIVE PERCENT OF RX'S	AMOUNT OF CHARGES PER RX	NUMBER OF RX'S PER USER
300.01	320.00	2,082	62.916%	539,454.78	105,469.18	644,923.96	16.945%	62,120.00	582,917.08	36,882	23.385%	17.49	17.71
290.01	300.00	1,066	61.218%	261,462.27	53,099.15	314,561.42	15.429%	31,122.00	283,505.71	18,609	21.598%	16.90	17.46
280.01	290.00	1,171	60.348%	278,533.62	55,119.43	333,653.05	14.689%	32,427.00	301,283.67	19,310	20.696%	17.28	16.49
270.01	280.00	1,098	59.392%	250,292.53	51,637.13	301,929.66	13.904%	30,397.00	271,579.16	18,028	19.761%	16.75	16.42
260.01	270.00	1,217	58.496%	267,425.00	55,276.75	322,701.75	13.195%	32,722.00	290,033.28	19,312	18.887%	16.71	15.87
250.01	260.00	1,263	57.503%	265,727.14	56,279.75	322,006.89	12.436%	33,116.00	288,968.76	19,631	17.951%	16.40	15.54
240.01	250.00	1,266	56.473%	256,808.07	53,320.36	310,128.43	11.679%	31,040.00	279,166.61	18,606	17.000%	16.67	14.70
230.01	240.00	1,323	55.440%	256,264.17	54,593.03	310,857.20	10.949%	32,220.00	278,689.03	19,063	16.099%	16.31	14.41
220.01	230.00	1,264	54.360%	235,915.49	48,542.46	284,457.95	10.219%	28,886.00	255,607.94	16,948	15.175%	16.78	13.41
210.01	220.00	1,324	53.329%	235,399.47	49,433.57	284,833.04	9.550%	28,903.00	255,992.05	17,257	14.354%	16.51	13.03
200.01	210.00	1,425	52.249%	239,985.66	52,297.35	292,283.01	8.880%	30,573.00	261,756.39	18,339	13.518%	15.94	12.87
190.01	200.00	1,450	51.086%	231,016.67	51,625.29	282,641.96	8.193%	29,895.00	252,804.23	18,071	12.629%	15.64	12.46
180.01	190.00	1,432	49.903%	216,171.32	48,783.45	264,954.77	7.528%	28,216.00	236,788.99	17,111	11.753%	15.48	11.95
170.01	180.00	1,372	48.734%	194,164.16	45,853.65	240,017.81	6.905%	26,708.00	213,353.50	16,018	10.924%	14.98	11.67
160.01	170.00	1,497	47.615%	200,377.37	46,772.84	247,150.21	6.341%	26,977.00	220,205.97	16,369	10.148%	15.10	10.93
150.01	160.00	1,610	46.394%	200,736.70	48,924.71	249,661.41	5.760%	28,109.00	221,613.95	17,119	9.355%	14.58	10.63
140.01	150.00	1,691	45.080%	196,626.70	48,492.95	245,119.65	5.173%	28,175.00	216,995.33	16,963	8.526%	14.45	10.03
130.01	140.00	1,690	43.700%	181,952.20	46,256.06	228,208.26	4.596%	26,657.00	201,593.08	16,170	7.704%	14.11	9.57
120.01	130.00	1,659	42.321%	165,620.10	41,832.39	207,452.49	4.060%	24,416.00	183,081.10	14,587	6.920%	14.22	8.79
110.01	120.00	1,785	40.968%	162,822.48	42,580.43	205,402.91	3.572%	24,677.00	180,740.35	14,880	6.213%	13.80	8.34
100.01	110.00	1,901	39.511%	157,481.24	42,446.27	199,927.51	3.089%	24,253.00	175,726.74	14,837	5.492%	13.47	7.80
95.01	100.00	875	37.960%	66,516.38	18,868.95	85,385.33	2.619%	10,855.00	74,552.71	6,592	4.773%	12.95	7.53
90.01	95.00	947	37.246%	68,661.63	18,972.25	87,633.88	2.418%	10,747.00	76,903.02	6,648	4.454%	13.18	7.02
85.01	90.00	1,019	36.473%	69,559.57	19,638.66	89,198.23	2.212%	11,093.00	78,132.18	6,879	4.132%	12.97	6.75
80.01	85.00	968	35.642%	61,629.39	18,229.80	79,859.19	2.002%	10,384.00	69,489.83	6,360	3.799%	12.56	6.57
75.01	80.00	1,021	34.852%	60,909.07	18,268.55	79,177.62	1.815%	10,293.00	68,892.53	6,372	3.490%	12.43	6.24
70.01	75.00	1,029	34.019%	57,124.45	17,431.05	74,555.50	1.628%	9,644.00	64,921.94	6,117	3.182%	12.19	5.94
65.01	70.00	1,024	33.179%	52,360.62	16,714.95	69,075.57	1.453%	9,478.00	59,608.25	5,848	2.885%	11.81	5.71
60.01	65.00	1,159	32.344%	55,053.18	17,430.93	72,484.11	1.291%	9,804.00	62,706.69	6,080	2.602%	11.92	5.25
55.01	60.00	1,025	31.398%	44,443.35	14,553.78	58,997.13	1.120%	8,064.00	50,944.88	5,088	2.307%	11.60	4.96
50.01	55.00	1,200	30.562%	47,138.49	15,848.83	62,987.32	0.982%	8,852.00	54,148.69	5,539	2.061%	11.37	4.62
45.01	50.00	1,225	29.583%	43,240.54	14,984.00	58,224.54	0.833%	8,409.00	49,828.42	5,254	1.792%	11.08	4.29
40.01	45.00	1,297	28.583%	40,522.92	14,600.45	55,123.37	0.697%	8,110.00	47,022.32	5,090	1.538%	10.83	3.92
35.01	40.00	1,312	27.525%	35,550.14	13,646.25	49,196.39	0.567%	7,523.00	41,685.70	4,753	1.291%	10.35	3.62
30.01	35.00	1,437	26.454%	33,854.24	12,795.80	46,650.04	0.451%	7,064.00	39,598.96	4,486	1.061%	10.40	3.12
25.01	30.00	1,401	25.282%	27,212.55	11,294.55	38,507.10	0.342%	6,150.00	32,364.20	3,950	0.843%	9.75	2.82
20.01	25.00	1,584	24.139%	24,631.86	10,998.35	35,630.21	0.251%	6,040.00	29,601.63	3,836	0.652%	9.29	2.42
15.01	20.00	1,705	22.846%	19,710.32	10,057.90	29,768.22	0.167%	5,331.00	24,449.14	3,517	0.466%	8.46	2.06
10.01	15.00	1,953	21.455%	15,402.80	8,845.65	24,248.45	0.097%	4,719.00	19,537.67	3,075	0.296%	7.89	1.57
5.01	10.00	1,869	19.862%	7,598.19	6,559.60	14,157.79	0.040%	3,294.00	10,871.11	2,300	0.147%	6.16	1.23
0.00	5.00	22,473	18.337%	866.98	2,072.85	2,939.83	0.007%	838.00	2,101.99	730	0.035%	4.03	0.03
TOTALS		122,558		36,615,202.87	5,914,581.90	42,529,784.77		3,551,444	38,984,896	2,063,810		20.61	16.84

RANGE OF CHARGES FROM	TO	NUMBER OF USERS	CUMULATIVE PERCENT OF USERS	INGREDIENT COST	DISPENSING FEE	AMOUNT OF CHARGES	CUMULATIVE PERCENT OF CHARGES	COPAY AMOUNT	NET CHECK AMOUNT	NUMBER OF RX'S	CUMULATIVE PERCENT OF RX'S	AMOUNT OF CHARGES PER RX	NUMBER OF RX'S PER USER
40,000.01	UP		100.000%	0.00	0.00	0.00	100.000%	0.00	0.00		100.000%	0.00	0.00
30,000.01	40,000.00		100.000%	0.00	0.00	0.00	100.000%	0.00	0.00		100.000%	0.00	0.00
20,000.01	30,000.00		100.000%	0.00	0.00	0.00	100.000%	0.00	0.00		100.000%	0.00	0.00
10,000.01	20,000.00	1	100.000%	11,771.02	59.50	11,830.52	100.000%	39.00	11,791.52	20	100.000%	591.53	20.00
9,000.01	10,000.00	2	99.999%	18,032.00	331.45	18,363.45	99.972%	175.00	18,188.45	118	99.999%	155.62	59.00
8,000.01	9,000.00		99.997%	0.00	0.00	0.00	99.929%	0.00	0.00		99.993%	0.00	0.00
7,000.01	8,000.00	1	99.997%	6,558.80	495.00	7,053.80	99.929%	360.00	6,693.80	180	99.993%	39.19	180.00
6,000.01	7,000.00	2	99.996%	12,389.25	1,259.50	13,648.75	99.912%	848.00	12,800.75	425	99.985%	32.11	212.50
5,000.01	6,000.00	9	99.994%	45,546.85	3,301.45	48,848.30	99.880%	2,151.00	46,706.93	1,154	99.964%	42.33	128.22
4,000.01	5,000.00	30	99.985%	118,868.09	9,666.75	128,534.84	99.765%	6,135.00	122,405.62	3,368	99.908%	38.16	112.27
3,000.01	4,000.00	168	99.955%	515,066.77	51,603.65	566,670.42	99.463%	32,906.00	533,959.62	17,960	99.745%	31.55	106.90
2,950.01	3,000.00	17	99.789%	45,912.65	4,682.70	50,595.35	98.131%	2,962.00	47,633.35	1,654	98.875%	30.59	97.29
2,900.01	2,950.00	19	99.772%	50,428.73	5,238.65	55,667.38	98.012%	3,368.00	52,320.26	1,857	98.795%	29.98	97.74
2,850.01	2,900.00	18	99.753%	46,387.16	5,307.55	51,694.71	97.881%	3,355.00	48,356.32	1,867	98.705%	27.69	103.72
2,800.01	2,850.00	23	99.735%	58,300.34	6,680.00	64,980.34	97.759%	4,172.00	60,819.29	2,300	98.614%	28.25	100.00
2,750.01	2,800.00	26	99.712%	65,275.70	6,846.80	72,122.50	97.607%	4,419.00	67,711.84	2,380	98.503%	30.30	91.54
2,700.01	2,750.00	22	99.687%	54,316.01	5,667.50	59,983.51	97.437%	3,517.00	56,474.48	1,936	98.387%	30.98	88.00
2,650.01	2,700.00	28	99.665%	67,203.42	7,657.55	74,860.97	97.296%	4,720.00	70,146.73	2,668	98.293%	28.06	95.29
2,600.01	2,650.00	33	99.637%	78,155.58	8,544.05	86,699.63	97.120%	5,238.00	81,464.44	3,023	98.164%	28.68	91.61
2,550.01	2,600.00	31	99.604%	70,877.02	8,928.25	79,805.27	96.916%	5,637.00	74,178.21	3,116	98.018%	25.61	100.52
2,250.01	2,550.00	36	99.573%	81,620.41	9,235.40	90,855.81	96.729%	6,036.00	84,821.35	3,205	97.867%	28.35	89.03
2,450.01	2,500.00	50	99.538%	111,892.37	11,994.05	123,886.42	96.515%	7,390.00	116,501.02	4,172	97.711%	29.69	83.44
2,400.01	2,450.00	51	99.488%	111,368.47	12,279.75	123,648.22	96.224%	7,482.00	116,190.86	4,313	97.509%	28.67	84.57
2,350.01	2,400.00	50	99.438%	106,312.72	12,500.60	118,813.32	95.933%	7,961.00	110,854.83	4,363	97.300%	27.23	87.26
2,300.01	2,350.00	58	99.388%	119,946.52	14,687.55	134,634.07	95.653%	9,238.00	125,398.40	5,091	97.089%	26.45	87.78
2,250.01	2,300.00	57	99.330%	117,520.58	12,078.65	129,599.23	95.337%	7,511.00	122,107.75	4,235	96.842%	30.60	74.30
2,200.01	2,250.00	72	99.274%	143,158.60	17,077.40	160,236.00	95.032%	10,516.00	149,726.76	5,930	96.637%	27.02	82.36
2,150.01	2,200.00	87	99.202%	170,423.21	18,974.10	189,397.31	94.655%	11,593.00	177,812.75	6,605	96.350%	28.67	75.92
2,100.01	2,150.00	92	99.116%	173,820.11	21,753.85	195,573.96	94.210%	13,414.00	182,160.71	7,518	96.030%	26.01	81.72
2,050.01	2,100.00	105	99.025%	194,360.83	23,333.40	217,694.23	93.750%	14,788.00	202,931.99	8,166	95.665%	26.66	77.77
2,000.01	2,050.00	143	98.921%	257,476.03	31,899.85	289,375.88	93.238%	20,168.00	269,232.64	11,165	95.270%	25.92	78.08
1,950.01	2,000.00	133	98.779%	234,328.50	28,571.10	262,899.60	92.558%	17,712.00	245,199.72	9,965	94.729%	26.38	74.92
1,900.01	1,950.00	148	98.647%	254,045.69	30,783.70	284,829.39	91.940%	18,879.00	266,112.96	10,679	94.246%	26.67	72.16
1,850.01	1,900.00	159	98.500%	263,288.70	34,586.35	297,875.05	91.270%	21,823.00	276,093.84	11,925	93.728%	24.98	75.00
1,800.01	1,850.00	182	98.343%	294,887.54	37,293.32	332,180.86	90.570%	22,698.00	309,568.42	12,928	93.151%	25.69	71.03
1,750.01	1,800.00	196	98.162%	308,668.34	38,994.69	347,663.03	89.789%	24,187.00	323,541.95	13,588	92.524%	25.59	69.33
1,700.01	1,750.00	202	97.968%	309,273.94	39,656.40	348,930.34	88.971%	24,850.00	324,098.26	13,784	91.866%	25.31	68.24
1,650.01	1,700.00	248	97.767%	368,565.50	46,455.03	415,020.53	88.151%	28,661.00	386,411.19	16,185	91.198%	25.64	65.26
1,600.01	1,650.00	293	97.521%	423,544.72	52,354.50	475,899.22	87.175%	32,157.00	443,835.99	18,249	90.414%	26.08	62.28
1,550.01	1,600.00	300	97.231%	419,399.95	53,051.89	472,451.84	86.056%	32,749.00	439,798.45	18,439	89.529%	25.62	61.46
1,500.01	1,550.00	382	96.933%	515,745.09	66,030.08	581,775.17	84.945%	40,738.00	541,133.28	23,007	88.636%	25.29	60.23
1,450.01	1,500.00	377	96.554%	491,977.50	63,755.90	555,733.40	83.577%	39,586.00	516,216.47	22,207	87.521%	25.03	58.90
1,400.01	1,450.00	417	96.180%	523,747.44	70,256.19	594,003.63	82.270%	43,718.00	550,417.30	24,394	86.445%	24.35	58.50

RANGE OF CHARGES FROM	RANGE OF CHARGES TO	NUMBER OF USERS	CUMULATIVE PERCENT OF OF USERS	INGREDIENT COST	DISPENSING FEE	AMOUNT OF CHARGES	CUMULATIVE PERCENT OF CHARGES	COPAY AMOUNT	NET CHECK AMOUNT	NUMBER OF RX'S	CUMULATIVE PERCENT OF RX'S	AMOUNT OF CHARGES PER RX	NUMBER OF RX'S PER USER
1,350.01	1,400.00	493	95.767%	597,810.79	79,376.04	677,186.83	80.874%	48,741.00	628,548.10	27,703	85.263%	24.44	56.19
1,300.01	1,350.00	561	95.277%	654,998.66	87,745.46	742,744.12	79.282%	53,539.00	689,282.67	30,608	83.921%	24.27	54.56
1,250.01	1,300.00	592	94.721%	664,609.88	89,785.46	754,395.34	77.535%	55,466.00	699,069.44	31,227	82.438%	24.16	52.75
1,200.01	1,250.00	627	94.134%	675,969.25	91,763.88	767,733.13	75.761%	56,653.00	711,160.39	32,018	80.925%	23.98	51.07
1,150.01	1,200.00	767	93.512%	792,659.37	107,930.76	900,590.13	73.956%	66,448.00	834,289.25	37,577	79.373%	23.97	48.99
1,100.01	1,150.00	854	92.751%	844,232.41	116,432.60	960,665.01	71.839%	71,570.00	889,173.19	40,434	77.553%	23.76	47.35
1,050.01	1,100.00	913	91.904%	860,654.88	120,140.73	980,795.61	69.580%	73,325.00	907,589.86	41,952	75.593%	23.38	45.95
1,000.01	1,050.00	1,054	90.998%	944,104.40	135,790.37	1,079,894.77	67.274%	82,773.00	997,241.39	47,268	73.561%	22.85	44.85
980.01	1,000.00	434	89.953%	375,001.46	54,757.06	429,758.52	64.735%	33,112.00	396,710.22	19,040	71.270%	22.57	43.87
960.01	980.00	477	89.522%	405,510.57	57,238.24	462,748.81	63.724%	35,097.00	427,726.41	20,015	70.348%	23.12	41.96
940.01	960.00	466	89.049%	388,289.16	54,381.43	442,670.59	62.636%	33,021.00	409,688.92	18,988	69.378%	23.31	40.75
920.01	940.00	535	88.587%	437,217.71	60,283.59	497,501.30	61.595%	36,337.00	461,245.47	21,050	68.458%	23.63	39.35
900.01	920.00	593	88.056%	471,033.94	68,557.43	539,591.37	60.425%	41,128.00	498,550.28	23,840	67.438%	22.63	40.20
880.01	900.00	546	87.468%	423,034.06	62,864.74	485,898.80	59.157%	37,610.00	448,380.39	21,987	66.283%	22.10	40.27
860.01	880.00	601	86.927%	455,393.48	67,317.90	522,711.38	58.014%	40,839.00	481,945.90	23,429	65.217%	22.31	38.98
840.01	860.00	608	86.330%	450,096.82	66,537.17	516,633.99	56.785%	40,617.00	476,060.97	23,221	64.082%	22.25	38.19
820.01	840.00	653	85.727%	470,736.55	71,077.35	541,813.90	55.570%	43,033.00	498,802.46	24,733	62.957%	21.91	37.88
800.01	820.00	707	85.080%	498,080.16	74,869.37	572,949.53	54.296%	45,276.00	527,723.40	26,109	61.759%	21.94	36.93
780.01	800.00	698	84.378%	479,729.84	71,923.21	551,653.05	52.949%	43,271.00	508,428.27	25,077	60.494%	22.00	35.93
760.01	780.00	726	83.686%	485,662.20	73,140.09	558,802.29	51.652%	44,168.00	514,749.16	25,494	59.278%	21.92	35.12
740.01	760.00	737	82.966%	479,645.95	73,050.00	552,695.95	50.338%	44,557.00	508,221.49	25,474	58.043%	21.70	34.56
720.01	740.00	739	82.235%	468,073.84	71,539.83	539,613.67	49.039%	43,206.00	496,561.22	24,856	56.809%	21.71	33.63
700.01	720.00	883	81.502%	542,639.50	84,132.90	626,772.40	47.770%	51,078.00	575,796.61	29,328	55.604%	21.37	33.21
680.01	700.00	851	80.626%	508,350.19	78,835.84	587,186.03	46.296%	47,401.00	539,878.91	27,531	54.183%	21.33	32.35
660.01	680.00	910	79.782%	530,164.32	79,591.26	609,755.58	44.915%	47,947.00	561,880.07	27,779	52.849%	21.95	30.53
640.01	660.00	919	78.879%	516,579.81	80,640.55	597,220.36	43.482%	48,896.00	548,419.22	28,164	51.503%	21.21	30.65
620.01	640.00	979	77.968%	532,235.50	84,408.02	616,643.52	42.077%	50,530.00	566,231.13	29,374	50.139%	20.99	30.00
600.01	620.00	1,041	76.996%	548,244.25	86,659.13	634,903.38	40.628%	52,230.00	582,737.28	30,254	48.715%	20.99	29.06
580.01	600.00	1,110	75.964%	565,828.82	89,185.17	655,013.99	39.135%	53,632.00	601,540.64	31,160	47.250%	21.02	28.07
560.01	580.00	1,131	74.863%	554,034.59	90,639.40	644,673.99	37.595%	54,132.00	590,647.76	31,710	45.740%	20.33	28.04
540.01	560.00	1,191	73.741%	561,252.13	93,954.38	655,206.51	36.079%	56,138.00	599,143.45	32,800	44.203%	19.98	27.54
520.01	540.00	1,210	72.560%	549,141.58	91,959.80	641,101.38	34.538%	54,957.00	586,226.92	32,138	42.614%	19.95	26.56
500.01	520.00	1,348	71.359%	587,311.71	99,826.46	687,138.17	33.031%	60,287.00	626,968.00	34,776	41.057%	19.76	25.80
480.01	500.00	1,391	70.022%	580,375.63	101,418.96	681,794.59	31.415%	60,579.00	621,300.13	35,385	39.372%	19.27	25.44
460.01	480.00	1,481	68.643%	593,868.39	102,180.88	696,049.27	29.812%	61,162.00	634,962.28	35,671	37.657%	19.51	24.09
440.01	460.00	1,525	67.174%	583,053.46	102,902.43	685,955.89	28.175%	61,178.00	624,859.81	35,987	35.929%	19.06	23.60
420.01	440.00	1,621	65.661%	591,347.92	105,944.88	697,292.80	26.563%	63,496.00	633,937.51	36,978	34.185%	18.86	22.81
400.01	420.00	1,721	64.053%	596,847.21	108,437.13	705,284.34	24.923%	64,552.00	640,845.54	37,966	32.393%	18.58	22.06
380.01	400.00	1,735	62.346%	573,335.84	103,224.04	676,559.88	23.265%	61,522.00	615,142.82	36,136	30.554%	18.72	20.83
360.01	380.00	1,878	60.625%	587,171.14	107,577.29	694,748.43	21.674%	63,889.00	630,954.16	37,684	28.803%	18.44	20.07
340.01	360.00	1,896	58.762%	557,093.19	106,365.61	663,458.80	20.040%	63,213.00	600,342.55	37,144	26.977%	17.86	19.59
320.01	340.00	1,979	56.881%	547,096.35	105,871.61	652,967.96	18.480%	62,680.00	590,349.21	36,982	25.177%	17.66	18.69
300.01	320.00	2,082	54.918%	539,454.78	105,469.18	644,923.96	16.945%	62,120.00	582,917.08	36,882	23.385%	17.49	17.71

RANGE OF CHARGES FROM	RANGE OF CHARGES TO	NUMBER OF USERS	CUMULATIVE PERCENT OF OF USERS	INGREDIENT COST	DISPENSING FEE	AMOUNT OF CHARGES	CUMULATIVE PERCENT OF CHARGES	COPAY AMOUNT	NET CHECK AMOUNT	NUMBER OF RX'S	CUMULATIVE PERCENT OF RX'S	AMOUNT OF CHARGES PER RX	NUMBER OF RX'S PER USER
290.01	300.00	1,066	52.853%	261,462.27	53,099.15	314,561.42	15.429%	31,122.00	283,505.71	18,609	21.598%	16.90	17.46
280.01	290.00	1,171	51.796%	278,533.62	55,119.43	333,653.05	14.689%	32,427.00	301,283.67	19,310	20.696%	17.28	16.49
270.01	280.00	1,098	50.634%	250,292.53	51,637.13	301,929.66	13.904%	30,397.00	271,579.16	18,028	19.761%	16.75	16.42
260.01	270.00	1,217	49.545%	267,425.00	55,276.75	322,701.75	13.195%	32,722.00	290,033.28	19,312	18.887%	16.71	15.87
250.01	260.00	1,263	48.338%	265,727.14	56,279.75	322,006.89	12.436%	33,116.00	288,968.76	19,631	17.951%	16.40	15.54
240.01	250.00	1,266	47.085%	256,808.07	53,320.36	310,128.43	11.679%	31,040.00	279,166.61	18,606	17.000%	16.67	14.70
230.01	240.00	1,323	45.829%	256,264.17	54,593.03	310,857.20	10.949%	32,220.00	278,689.03	19,063	16.099%	16.31	14.41
220.01	230.00	1,264	44.517%	235,915.49	48,542.46	284,457.95	10.219%	28,886.00	255,607.94	16,948	15.175%	16.78	13.41
210.01	220.00	1,324	43.263%	235,399.47	49,433.57	284,833.04	9.550%	28,903.00	255,992.05	17,257	14.354%	16.51	13.03
200.01	210.00	1,425	41.950%	239,985.66	52,297.35	292,283.01	8.880%	30,573.00	261,756.39	18,339	13.518%	15.94	12.87
190.01	200.00	1,450	40.537%	231,016.67	51,625.29	282,641.96	8.193%	29,895.00	252,804.23	18,071	12.629%	15.64	12.46
180.01	190.00	1,432	39.098%	216,171.32	48,783.45	264,954.77	7.528%	28,216.00	236,788.99	17,111	11.753%	15.48	11.95
170.01	180.00	1,372	37.678%	194,164.16	45,853.65	240,017.81	6.905%	26,708.00	213,353.50	16,018	10.924%	14.98	11.67
160.01	170.00	1,497	36.317%	200,377.37	46,772.84	247,150.21	6.341%	26,977.00	220,205.97	16,369	10.148%	15.10	10.93
150.01	160.00	1,610	34.832%	200,736.70	48,924.71	249,661.41	5.760%	28,109.00	221,613.95	17,119	9.355%	14.58	10.63
140.01	150.00	1,691	33.235%	196,626.70	48,492.95	245,119.65	5.173%	28,175.00	216,995.33	16,963	8.526%	14.45	10.03
130.01	140.00	1,690	31.558%	181,952.20	46,256.06	228,208.26	4.596%	26,657.00	201,593.08	16,170	7.704%	14.11	9.57
120.01	130.00	1,659	29.881%	165,620.10	41,832.39	207,452.49	4.060%	24,416.00	183,081.10	14,587	6.920%	14.22	8.79
110.01	120.00	1,785	28.236%	162,822.48	42,580.43	205,402.91	3.572%	24,677.00	180,740.35	14,880	6.213%	13.80	8.34
100.01	110.00	1,901	26.465%	157,481.24	42,446.27	199,927.51	3.089%	24,253.00	175,726.74	14,837	5.492%	13.47	7.80
95.01	100.00	875	24.580%	66,516.38	18,868.95	85,385.33	2.619%	10,855.00	74,552.71	6,592	4.773%	12.95	7.53
90.01	95.00	947	23.712%	68,661.63	18,972.25	87,633.88	2.418%	10,747.00	76,903.02	6,648	4.454%	13.18	7.02
85.01	90.00	1,019	22.772%	69,559.57	19,638.66	89,198.23	2.212%	11,093.00	78,132.18	6,879	4.132%	12.97	6.75
80.01	85.00	968	21.762%	61,629.39	18,229.80	79,859.19	2.002%	10,384.00	69,489.83	6,360	3.799%	12.56	6.57
75.01	80.00	1,021	20.801%	60,909.07	18,268.55	79,177.62	1.815%	10,293.00	68,892.53	6,372	3.490%	12.43	6.24
70.01	75.00	1,029	19.789%	57,124.45	17,431.05	74,555.50	1.628%	9,644.00	64,921.94	6,117	3.182%	12.19	5.94
65.01	70.00	1,024	18.768%	52,360.62	16,714.95	69,075.57	1.453%	9,478.00	59,608.25	5,848	2.885%	11.81	5.71
60.01	65.00	1,159	17.752%	55,053.18	17,430.93	72,484.11	1.291%	9,804.00	62,706.69	6,080	2.602%	11.92	5.25
55.01	60.00	1,025	16.603%	44,443.35	14,553.78	58,997.13	1.120%	8,064.00	50,944.88	5,088	2.307%	11.60	4.96
50.01	55.00	1,200	15.586%	47,138.49	15,848.83	62,987.32	0.982%	8,852.00	54,148.69	5,539	2.061%	11.37	4.62
45.01	50.00	1,225	14.396%	43,240.54	14,984.00	58,224.54	0.833%	8,409.00	49,828.42	5,254	1.792%	11.08	4.29
40.01	45.00	1,297	13.181%	40,522.92	14,600.45	55,123.37	0.697%	8,110.00	47,022.32	5,090	1.538%	10.83	3.92
35.01	40.00	1,312	11.894%	35,550.14	13,646.25	49,196.39	0.567%	7,523.00	41,685.70	4,753	1.291%	10.35	3.62
30.01	35.00	1,437	10.593%	33,854.24	12,795.80	46,650.04	0.451%	7,064.00	39,598.96	4,486	1.061%	10.40	3.12
25.01	30.00	1,401	9.167%	27,212.55	11,294.55	38,507.10	0.342%	6,150.00	32,364.20	3,950	0.843%	9.75	2.82
20.01	25.00	1,584	7.778%	24,631.86	10,998.35	35,630.21	0.251%	6,040.00	29,601.63	3,836	0.652%	9.29	2.42
15.01	20.00	1,705	6.206%	19,710.32	10,057.90	29,768.22	0.167%	5,331.00	24,449.14	3,517	0.466%	8.46	2.06
10.01	15.00	1,953	4.515%	15,402.80	8,845.65	24,248.45	0.097%	4,719.00	19,537.67	3,075	0.296%	7.89	1.57
5.01	10.00	1,869	2.578%	7,598.19	6,559.60	14,157.79	0.040%	3,294.00	10,871.11	2,300	0.147%	6.16	1.23
0.01	5.00	730	0.724%	866.98	2,072.85	2,939.83	0.007%	838.00	2,101.99	730	0.035%	4.03	1.00
TOTALS		100,815		36,615,202.87	5,914,581.90	42,529,784.77		3,551,444	38,984,896	2,063,810		20.61	20.47

NUMBER OF ELIGIBLES	CUMULATIVE PERCENT OF ELIGIBLES	CUMULATIVE PERCENT OF CHARGES	10%	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	100.000%	100.000%	17,321	17,960	18,616	19,289	19,981	20,692	21,421	22,169	22,937	23,724	24,532
2	99.999%	99.972%	13,443	13,939	14,448	14,971	15,508	16,059	16,625	17,206	17,801	18,412	19,039
1	99.998%	99.929%	10,327	10,708	11,099	11,501	11,914	12,337	12,772	13,218	13,676	14,145	14,627
2	99.997%	99.912%	9,992	10,360	10,738	11,127	11,526	11,936	12,356	12,788	13,231	13,685	14,151
9	99.995%	99.880%	7,947	8,239	8,540	8,850	9,167	9,493	9,827	10,171	10,523	10,884	11,255
30	99.988%	99.765%	6,273	6,504	6,742	6,986	7,236	7,494	7,758	8,029	8,307	8,592	8,884
168	99.963%	99.463%	4,938	5,121	5,308	5,500	5,697	5,899	6,107	6,321	6,540	6,764	6,994
17	99.826%	98.131%	4,357	4,518	4,683	4,853	5,027	5,205	5,389	5,577	5,770	5,968	6,171
19	99.812%	98.012%	4,290	4,448	4,610	4,777	4,948	5,124	5,305	5,490	5,680	5,875	6,075
18	99.797%	97.881%	4,205	4,360	4,519	4,683	4,851	5,023	5,200	5,382	5,568	5,759	5,955
23	99.782%	97.759%	4,136	4,289	4,446	4,606	4,772	4,941	5,115	5,294	5,477	5,666	5,858
26	99.763%	97.607%	4,061	4,211	4,365	4,523	4,685	4,852	5,023	5,198	5,378	5,563	5,752
22	99.742%	97.437%	3,992	4,139	4,290	4,446	4,605	4,769	4,937	5,109	5,286	5,468	5,654
28	99.724%	97.296%	3,914	4,059	4,207	4,359	4,516	4,676	4,841	5,010	5,184	5,361	5,544
33	99.701%	97.120%	3,847	3,988	4,134	4,284	4,437	4,595	4,757	4,923	5,094	5,269	5,448
31	99.674%	96.916%	3,769	3,908	4,051	4,197	4,348	4,503	4,661	4,824	4,991	5,162	5,338
36	99.649%	96.729%	3,695	3,831	3,971	4,115	4,263	4,414	4,570	4,729	4,893	5,061	5,233
50	99.620%	96.515%	3,628	3,761	3,899	4,040	4,185	4,334	4,486	4,643	4,804	4,969	5,138
51	99.579%	96.224%	3,550	3,681	3,815	3,953	4,095	4,240	4,390	4,543	4,701	4,862	5,027
50	99.537%	95.933%	3,479	3,607	3,739	3,874	4,013	4,156	4,303	4,453	4,607	4,765	4,927
58	99.497%	95.653%	3,399	3,524	3,653	3,785	3,921	4,060	4,203	4,350	4,500	4,655	4,813
57	99.449%	95.337%	3,329	3,452	3,578	3,707	3,840	3,977	4,117	4,261	4,408	4,559	4,715
72	99.403%	95.032%	3,258	3,378	3,502	3,629	3,759	3,892	4,030	4,170	4,315	4,463	4,615
87	99.344%	94.655%	3,187	3,305	3,426	3,550	3,677	3,808	3,942	4,079	4,221	4,366	4,514
92	99.273%	94.210%	3,112	3,227	3,345	3,466	3,590	3,718	3,849	3,984	4,121	4,263	4,408
105	99.198%	93.750%	3,035	3,147	3,262	3,380	3,502	3,626	3,754	3,885	4,020	4,158	4,299
143	99.112%	93.238%	2,963	3,072	3,184	3,299	3,418	3,539	3,664	3,792	3,923	4,058	4,196
133	98.996%	92.558%	2,894	3,001	3,110	3,223	3,339	3,457	3,579	3,704	3,832	3,964	4,099
148	98.887%	91.940%	2,818	2,922	3,028	3,138	3,250	3,366	3,485	3,606	3,731	3,859	3,991
159	98.766%	91.270%	2,743	2,844	2,948	3,055	3,164	3,277	3,392	3,511	3,632	3,757	3,885
182	98.637%	90.570%	2,672	2,771	2,872	2,976	3,083	3,192	3,305	3,420	3,539	3,660	3,785
196	98.488%	89.789%	2,597	2,693	2,791	2,892	2,996	3,102	3,212	3,324	3,439	3,557	3,678
202	98.328%	88.971%	2,529	2,622	2,718	2,816	2,917	3,021	3,128	3,237	3,349	3,464	3,582
248	98.163%	88.151%	2,450	2,540	2,633	2,729	2,826	2,927	3,030	3,136	3,244	3,356	3,470
293	97.961%	87.175%	2,378	2,466	2,556	2,648	2,743	2,841	2,941	3,044	3,149	3,257	3,368
300	97.722%	86.056%	2,306	2,391	2,478	2,568	2,660	2,754	2,851	2,951	3,053	3,158	3,266

ENTIRE YEAR [illegible]BLES >=65 YEARS

TABLE 6 – ESTIMATED 199[illegible] ELIGIBLE ANNUAL CHARGES

AT VARIOUS [illegible]TF [illegible]ENDING RATES

NUMBER OF ELIGIBLES	CUMULATIVE PERCENT OF ELIGIBLES	CUMULATIVE PERCENT OF CHARGES	10%	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
382	97.477%	84.945%	2,230	2,312	2,396	2,483	2,572	2,664	2,758	2,854	2,953	3,054	3,158
377	97.165%	83.577%	2,158	2,238	2,320	2,403	2,490	2,578	2,669	2,762	2,858	2,956	3,057
417	96.858%	82.270%	2,086	2,162	2,241	2,323	2,406	2,491	2,579	2,669	2,762	2,857	2,954
493	96.518%	80.874%	2,011	2,085	2,161	2,240	2,320	2,402	2,487	2,574	2,663	2,755	2,848
561	96.115%	79.282%	1,938	2,010	2,083	2,159	2,236	2,316	2,397	2,481	2,567	2,655	2,745
592	95.658%	77.535%	1,866	1,935	2,005	2,078	2,152	2,229	2,307	2,388	2,471	2,555	2,642
627	95.175%	75.761%	1,793	1,859	1,927	1,996	2,068	2,142	2,217	2,294	2,374	2,455	2,539
767	94.663%	73.956%	1,719	1,782	1,848	1,914	1,983	2,054	2,126	2,200	2,276	2,355	2,435
854	94.037%	71.839%	1,647	1,708	1,770	1,834	1,900	1,967	2,037	2,108	2,181	2,256	2,333
913	93.340%	69.580%	1,573	1,631	1,690	1,752	1,814	1,879	1,945	2,013	2,083	2,154	2,228
1,054	92.595%	67.274%	1,500	1,555	1,612	1,671	1,730	1,792	1,855	1,920	1,986	2,055	2,125
434	91.735%	64.735%	1,450	1,503	1,558	1,615	1,672	1,732	1,793	1,856	1,920	1,986	2,053
477	91.381%	63.724%	1,420	1,473	1,527	1,582	1,638	1,697	1,757	1,818	1,881	1,945	2,012
466	90.992%	62.636%	1,391	1,442	1,495	1,549	1,604	1,661	1,720	1,780	1,842	1,905	1,970
535	90.612%	61.595%	1,361	1,412	1,463	1,516	1,571	1,626	1,684	1,743	1,803	1,865	1,928
593	90.175%	60.425%	1,332	1,381	1,432	1,484	1,537	1,591	1,648	1,705	1,764	1,825	1,887
546	89.691%	59.157%	1,303	1,351	1,400	1,451	1,503	1,556	1,611	1,668	1,725	1,785	1,845
601	89.246%	58.014%	1,273	1,320	1,369	1,418	1,469	1,521	1,575	1,630	1,686	1,744	1,803
608	88.756%	56.785%	1,244	1,290	1,337	1,385	1,435	1,486	1,539	1,592	1,647	1,704	1,762
653	88.259%	55.570%	1,215	1,260	1,306	1,353	1,401	1,451	1,502	1,555	1,609	1,664	1,721
707	87.727%	54.296%	1,186	1,230	1,275	1,321	1,369	1,417	1,467	1,519	1,571	1,625	1,680
698	87.150%	52.949%	1,157	1,200	1,244	1,289	1,335	1,382	1,431	1,481	1,532	1,585	1,639
726	86.580%	51.652%	1,127	1,168	1,211	1,255	1,300	1,346	1,394	1,442	1,492	1,544	1,596
737	85.988%	50.338%	1,098	1,138	1,180	1,223	1,267	1,312	1,358	1,405	1,454	1,504	1,555
739	85.387%	49.039%	1,069	1,108	1,149	1,191	1,233	1,277	1,322	1,368	1,416	1,464	1,514
883	84.784%	47.770%	1,039	1,078	1,117	1,157	1,199	1,241	1,285	1,330	1,376	1,423	1,472
851	84.063%	46.296%	1,010	1,047	1,086	1,125	1,165	1,207	1,249	1,293	1,338	1,384	1,431
910	83.369%	44.915%	981	1,017	1,054	1,093	1,132	1,172	1,213	1,256	1,299	1,344	1,389
919	82.626%	43.482%	951	987	1,023	1,060	1,098	1,137	1,177	1,218	1,260	1,303	1,348
979	81.876%	42.077%	922	956	991	1,027	1,064	1,102	1,140	1,180	1,221	1,263	1,306
1,041	81.078%	40.628%	893	926	960	994	1,030	1,067	1,104	1,143	1,182	1,223	1,265
1,110	80.228%	39.135%	864	896	929	962	997	1,032	1,068	1,106	1,144	1,183	1,224
1,131	79.322%	37.595%	835	865	897	929	963	997	1,032	1,068	1,105	1,143	1,182
1,191	78.400%	36.079%	805	835	866	897	929	962	996	1,031	1,067	1,103	1,141
1,210	77.428%	34.538%	776	804	834	864	895	927	959	993	1,027	1,063	1,099
1,348	76.441%	33.031%	746	774	802	831	861	892	923	955	988	1,022	1,057

NUMBER OF ELIGIBLES	CUMULATIVE PERCENT OF ELIGIBLES	CUMULATIVE PERCENT OF CHARGES	10%	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1,391	75.341%	31.415%	718	744	771	799	828	857	887	918	950	983	1,016
1,481	74.206%	29.812%	688	713	740	766	794	822	851	881	911	942	975
1,525	72.997%	28.175%	659	683	708	733	760	787	814	843	872	902	933
1,621	71.753%	26.563%	630	653	677	701	727	752	779	806	834	863	892
1,721	70.430%	24.923%	600	622	645	668	692	717	742	768	795	822	850
1,735	69.026%	23.265%	571	592	614	636	659	682	706	731	756	782	809
1,878	67.610%	21.674%	542	562	582	603	625	647	670	693	717	742	767
1,896	66.078%	20.040%	512	531	551	571	591	612	634	656	678	702	726
1,979	64.531%	18.480%	483	501	519	538	557	577	597	618	640	662	684
2,082	62.916%	16.945%	454	470	487	505	523	542	561	580	601	621	642
1,066	61.218%	15.429%	432	448	464	481	498	516	534	553	572	592	612
1,171	60.348%	14.689%	417	433	448	465	481	498	516	534	552	571	591
1,098	59.392%	13.904%	403	417	433	448	464	481	498	515	533	551	570
1,217	58.496%	13.195%	388	403	417	432	448	464	480	497	514	532	550
1,263	57.503%	12.436%	373	387	401	416	431	446	462	478	494	511	529
1,266	56.473%	11.679%	359	372	385	399	414	428	444	459	475	491	508
1,323	55.440%	10.949%	344	357	370	383	397	411	425	440	456	471	487
1,264	54.360%	10.219%	329	342	354	367	380	394	407	422	436	451	467
1,324	53.329%	9.550%	315	327	339	351	363	376	390	403	417	431	446
1,425	52.249%	8.880%	300	311	323	334	346	359	371	384	398	411	425
1,450	51.086%	8.193%	285	296	307	318	329	341	353	365	378	391	404
1,432	49.903%	7.528%	271	281	291	302	312	324	335	347	359	371	384
1,372	48.734%	6.905%	256	266	275	285	295	306	317	328	339	351	363
1,497	47.615%	6.341%	242	251	260	269	279	289	299	309	320	331	342
1,610	46.394%	5.760%	227	235	244	253	262	271	281	291	301	311	322
1,691	45.080%	5.173%	212	220	228	236	245	254	262	272	281	291	301
1,690	43.700%	4.596%	198	205	212	220	228	236	244	253	262	271	280
1,659	42.321%	4.060%	183	190	197	204	211	219	226	234	242	251	259
1,785	40.968%	3.572%	168	175	181	188	194	201	208	216	223	231	239
1,901	39.511%	3.089%	154	160	165	171	178	184	190	197	204	211	218
875	37.960%	2.619%	143	148	154	159	165	171	177	183	189	196	202
947	37.246%	2.418%	135	140	146	151	156	162	168	173	179	186	192
1,019	36.473%	2.212%	128	133	138	143	148	153	158	164	170	176	182
968	35.642%	2.002%	121	125	130	135	139	144	149	155	160	165	171
1,021	34.852%	1.815%	114	118	122	126	131	136	140	145	150	156	161
1,029	34.019%	1.628%	106	110	114	118	122	127	131	136	140	145	150

TABLE 6 – ESTIMATED PER ELIGIBLE ANNUAL CHARGES

NUMBER OF ELIGIBLES	CUMULATIVE PERCENT OF ELIGIBLES	CUMULATIVE PERCENT OF CHARGES	10%	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1,024	33.179%	1.453%	99	102	106	110	114	118	122	126	131	135	140
1,159	32.344%	1.291%	92	95	98	102	106	109	113	117	121	125	130
1,025	31.398%	1.120%	84	87	91	94	97	101	104	108	112	115	119
1,200	30.562%	0.982%	77	80	83	86	89	92	95	98	102	105	109
1,225	29.583%	0.833%	70	72	75	77	80	83	86	89	92	95	99
1,297	28.583%	0.697%	62	65	67	69	72	74	77	80	82	85	88
1,312	27.525%	0.567%	55	57	59	61	63	66	68	70	73	75	78
1,437	26.454%	0.451%	48	49	51	53	55	57	59	61	63	65	67
1,401	25.282%	0.342%	40	42	43	45	46	48	50	52	53	55	57
1,584	24.139%	0.251%	33	34	35	37	38	39	41	42	44	45	47
1,705	22.846%	0.167%	26	27	27	28	29	31	32	33	34	35	36
1,953	21.455%	0.097%	18	19	20	20	21	22	22	23	24	25	26
1,869	19.862%	0.040%	11	11	12	12	13	13	14	14	15	15	16
22,473	18.337%	0.007%	0	0	0	0	0	0	0	0	0	0	0
122,558													

CMS LIBRARY
3 8095 00014115 6